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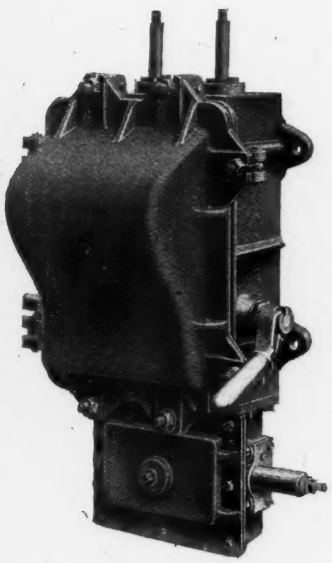

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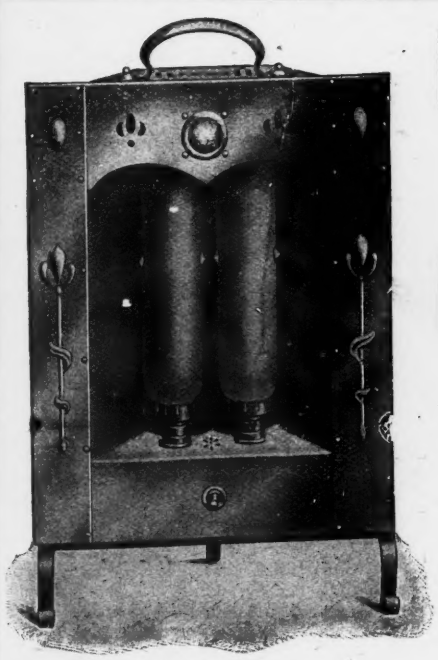

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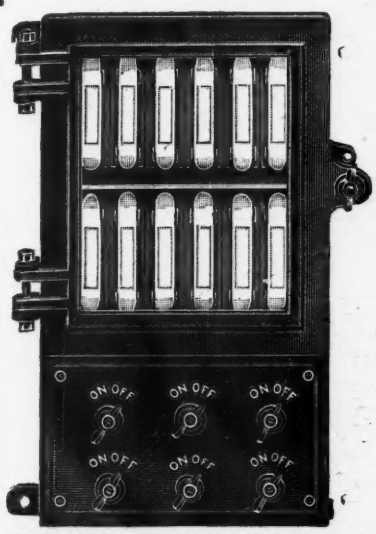

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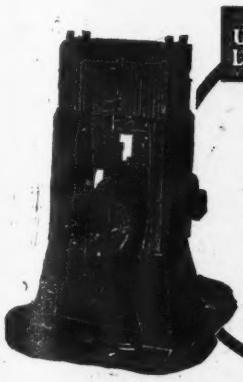

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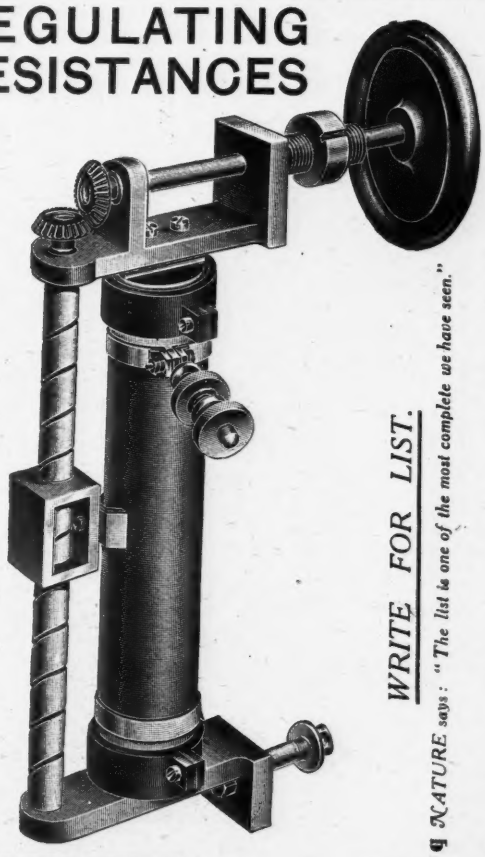

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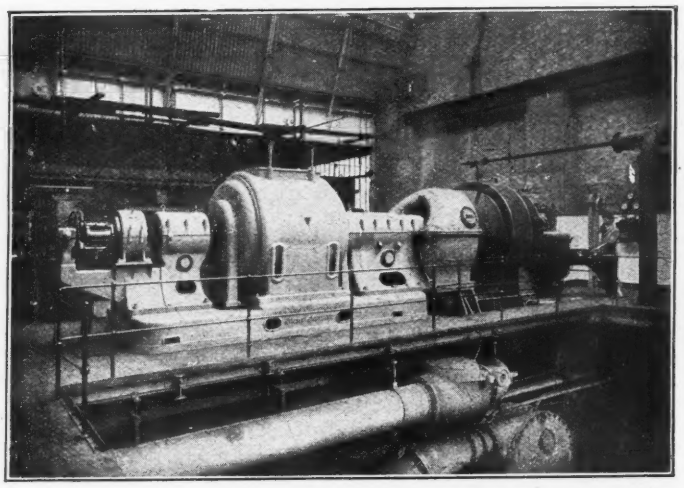

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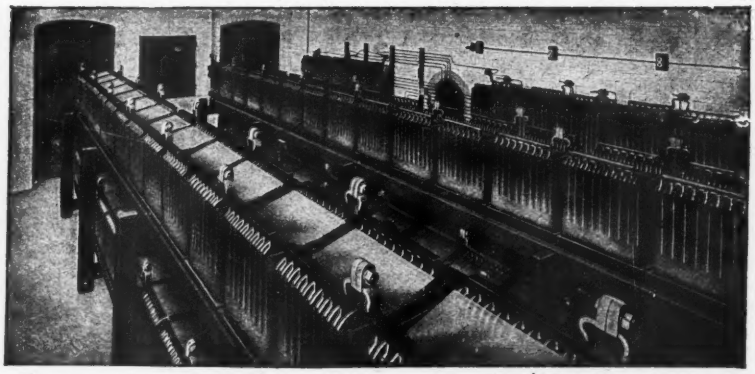

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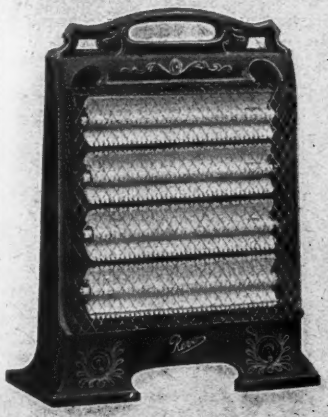

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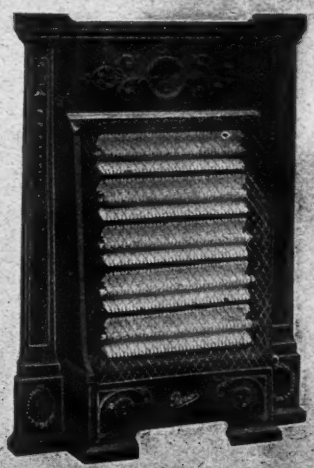

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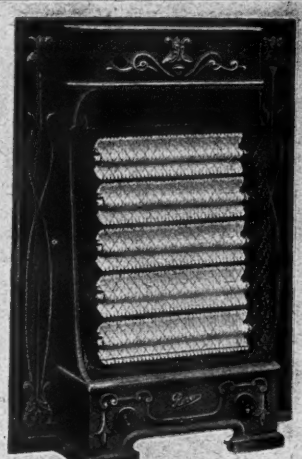

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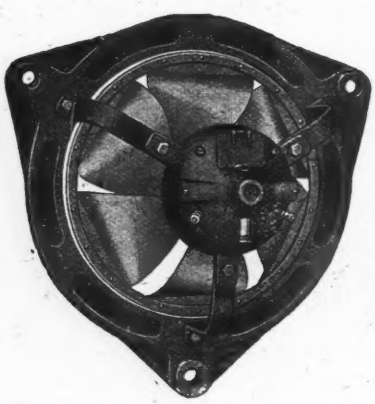

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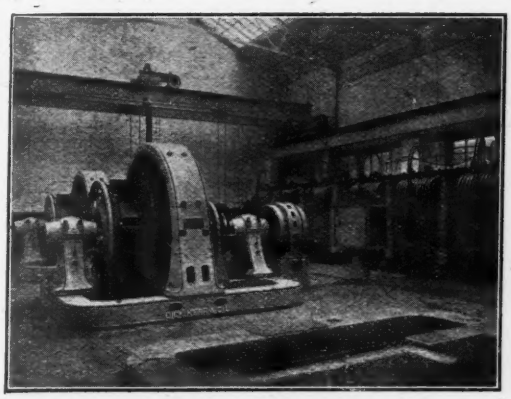

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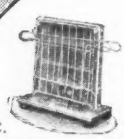

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FULL DAY COURSES in the Theory and Practice of Civil, Mechanical and Electrical Engineering will commence on Monday, 2nd OCTOBER, 1916. The Courses in Civil and Mechanical Engineering include specialization in Automobile and Aeronautical Engineering, and those in Electrical Engineering include specialization in Radio-Telegraphy. Entrance Examination on Tuesday and Wednesday, 26th and 27th September, 1916. These courses include periods spent in Commercial Workshops and extend over four years. They also prepare for the Degree of B.Sc. in Engineering at the University of London. Fees £15 or £11 per annum. Three Entrance Scholarships of the value of £52 each will be offered for competition at the Entrance Examination in September, 1916.

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Full and part-time Courses in all branches of this important department of Applied Science will be given in specially equipped Laboratories and Lecture Rooms. An Aitchison Scholarship (value £30) will be offered in this department at the Entrance Examination.

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R. MULLINEUX WALMSLEY, D.Sc., *Principal*. 5889

CITY AND GUILDS TECHNICAL COLLEGE, FINSBURY,

LEONARD STREET, LONDON, E.C.

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THE training is adapted to the needs of the various students, including (*a*) Pupils from secondary schools above the age of 15 who desire to receive a practical and scientific training bearing upon their future industry or profession; and (*b*) young men who, having previously served a pupilage or apprenticeship in works, desire to go through a more systematic training in engineering and applied chemistry.

The College contains laboratories and workshops equipped for instructional purposes, including Engineering and Hydraulic Laboratories, Drawing Offices, Wood and Metal Workshops, Mechanics, Physics, Electrical and Chemical Laboratories, and Dynamo Rooms.

The next Entrance Examination will be held on September 19th in the subjects of Mathematics and English, but the Matriculation Examination of any British University is accepted instead.

The fees are £20 per annum.

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EDUCATIONAL NOTICES.—*Continued.*

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SITUATIONS VACANT.

Latest time for receiving 9.30 a.m. Thursday.

If letters are not to be delivered to certain firms or individuals (if known), instructions to that effect should be sent to the Manager of the ELECTRICAL REVIEW, who will do his best to carry out such instructions. Letters of applicants cannot in such cases be returned to them, nor can the names of Advertisers using a number in any way be disclosed.

Original Testimonials should never be sent.

GENERAL MANAGER WANTED.

GENERAL MANAGER wanted by a Yorkshire firm engaged on electrical coal-cutters and conveyors — 200 employés normally, about 400 at present time (including females) engaged on shells. Salary £700, with prospective position of Managing Director and increased remuneration.

Apply stating age, training, experience in construction of electrical machinery, turbines and other work. Underground experience of secondary importance.

As efficient staff now carrying on business, reasonable time allowed to take up position.

5932, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

NEATH RURAL DISTRICT COUNCIL.

Shift Engineer.

REQUIRED immediately, Shift Engineer used to A.C. work; wages commencing 35s. per week, and war bonus.

Apply, with testimonials, stating age and experience, and when duties could be commenced, not later than August 18th, 1916, to

G. H. THOMSON,
Electrical Engineer and Manager.
8, New Street, Neath. 5937

CORPORATION OF WAKEFIELD ELECTRICITY DEPARTMENT.

CHARGE Engineer wanted for the above Power Station to take charge of a shift with polyphase H.T. plant, high-speed engines and turbines.

Previous experience in similar position essential.

Salary to commence £2 per week, rising to 42s. if satisfactory

Applications in writing, with copies of not more than three recent testimonials, and giving age and full details of experience, to be addressed to the CITY ELECTRICAL ENGINEER, Old Town Hall, Wakefield. 5942

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APPRENTICE.—A firm of electrical engineers in the London district have vacancy for an apprentice; small premium.—722, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SITUATIONS VACANT.—*Continued.*

ARMATURE Winder.—Wanted First-class Man for Tramway Depôt; permanency if suitable.—Apply GENERAL MANAGER, Rotherham Corporation Tramways, Rawmarsh Road, Rotherham. 5920

ARMATURE Winder wanted for repairs of all kinds; must have good all-round experience. No one engaged on Government work, or residing more than 10 miles away, need apply.—Write full particulars and wages required, to STEPHENS, SMITH & CO., LTD., Cuba Street, Millwall, London, E. 5911

ASSISTANT Switchboard Operator, 11,000-volt, three-phase Power Station (London District). Give age and state wages required.—Only men who can be released by present employer need apply.—5838, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ASSISTANT to Works Manager and Secretary wanted; must not be eligible for military service.—5927, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

CABLE Jointer required, accustomed to paper lead-covered cables. Wages 35s. to 40s. per week, and 2s. war bonus.—Apply in writing to THE FIFE ELECTRIC POWER COMPANY, 8, New Row, Dunfermline. 5851

CHARGE Engineer wanted; must have thorough mechanical and electrical training and experience with high and low-tension D.C. and 3-phase A.C. work, rotary converters, batteries, train supply, and be ineligible for military service. Pay 40s. weekly. Apply with full particulars of age, experience, if married, present employment and pay, to 5871, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

CHIEF Clerk wanted, Generating Station Office, London. Must be good shorthand typist, limited but technical correspondence; accustomed to modern filing, technical records and simple slide-rule work; take charge of two or three juniors. Permanent position for man of energy and sound experience in similar position. Salary about £3 per week.—5926, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Firm in Midlands, manufacturing large and small motors, requires Rate Fixer, thoroughly experienced in up-to-date machine processes and capable of determining piecework rates for each and every process. No person on Government work will be engaged. Applicants must state salary required, age, and details of experience during last six years.—Apply your nearest LABOUR EXCHANGE, quoting No. A2139. 5843

ELECTRICAL Testers (Improvers) wanted immediately by Government controlled establishment in West London. Those already on Government work will not be entertained.—Apply to your nearest BOARD OF TRADE LABOUR EXCHANGE, mentioning this paper and No. A2162. 5898

ELECTRICIAN (ineligible) required at First-class Hotel on Sea Front. Duties include full charge of electrical plant, hotel heating and steam apparatus. Stoker employed. Food supplied; sleep out. Should have had previous experience of hotel work, gas engines, battery, telephones, &c.—Apply, giving copies of testimonials, stating age and salary expected, to MANAGER, South-Eastern Hotel, Deal. 5933

ENGINE Driver wanted, experience with steam turbines necessary, D.C. and A.C. plant, for South London station. Wages £2 per week of 56 hours.—5940, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ENGINEER-IN-CHARGE wanted at once for the Bexley U.D.C. Experience in turbines, mechanical stokers, water-tube boilers and H.T. single-phase and traction systems an advantage. Permanency for suitable man. Salary £2 per week.—Apply, giving full particulars, to H. P. STOKES, Engineer and Manager, Electric and Tramways Dept., Broadway, Bexleyheath, Kent. 5939

FITTER, with good experience of maintenance of Boilers, High Speed Engines and Steam Heating Plant, required immediately for Government work. Good wages, war bonus and overtime. No man on Government work can be engaged.—Write or apply in first instance to your nearest BOARD OF TRADE LABOUR EXCHANGE, mentioning this paper and No. A2171. 5916

FOREMAN (working) to take charge of Electrical Instrument Shop. Experienced in setting up Capstans. Permanency to good man. No person resident more than 10 miles away, or already engaged on Government work, will be engaged.—GRAHAM AND LATHAM, 27, Lots Road, Chelsea. 5924

GLASSBLOWERS for shop on War Service. Preferably experienced in lamps or scientific work. No applications can be considered from individuals already on War work.—Apply stating experience and wages required, in confidence, to 5833, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

GOOD all-round Electrical Mechanic (age between 45 and 60), or a younger man who is ineligible for military service or munition work, required immediately to take charge of electrical installation of 1,250 points, as well as arc lamps and motors; current supplied from Borough. Man used to wiring and capable of arc lamp and battery maintenance and general electrical repairs. Appointment for duration of war; wages 52s. per week of 52 hours, and overtime, when necessary, at 1s. 3d. per hour.—Apply by letter, stating age, experience, and with copies of not more than three recent testimonials, to PROF. J. T. MORRIS, M.I.E.E., East London College, Mile End Road, E. 759

(Continued on next page.)

SITUATIONS VACANT.—*Continued.*

GOOD All-round Electrician required; permanent for a suitable man; ineligible; state rate. No person on Government work need apply.—Apply your nearest LABOUR EXCHANGE, quoting No. 760, ELECTRICAL REVIEW.

JUNIOR Draughtsman, with switchgear experience. S.E. district. No person resident more than 10 miles away, or already engaged on Government work, will be engaged.—Apply, stating experience, salary and age, to 736, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

REQUIRED immediately for Gold-Producing Mine, West Africa, One Competent Electrician, with experience 3-phase installations.—Apply with copies testimonials, stating age, experience and salary required, to 5919, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

STOREKEEPER, accustomed to electrical accessories; ineligible for military service. S.E. London district.—789, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SUB-STATION Attendants and Assistants (London district). Men of each grade required. Charge Attendants must have had experience with rotaries and H.T. three-phase systems. Only men who can be released by present employers need apply. Describe experience fully, and state wages desired. — 5839, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SWITCHBOARD Attendant wanted in combined D.C. and A.C. Station. Pay 25s. weekly. Must be ineligible for military service.—Apply with full particulars of age, training and experience, to 5872, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TRAMWAY Car Shed Night Foreman required. Apply, stating age, wages required and experience.—RHONDDA TRAMWAYS CO., LTD., Porth, Glam. 686

WANTED, Packer used to Electrical Goods. Must be ineligible or over military age.—Box 2207, c/o Brown's, 21, Tothill Street, Westminster, S.W. 750

WANTED, Stoker at the Acton Dust Destructor. Man used to Hughes & Stirling's Destructor preferred. Wages 41s. per week, including war bonus. Applicants must not be eligible for military service.—Applications stating age, experience and references, to be delivered to the SURVEYOR, Council Offices, Acton. 765

WANTED, urgently for Munition Works, Experienced Electricians capable of taking charge of plant, including Motors, Starters, Trip Fuses and Wiring. Only applicants ineligible for H.M.'s Forces and not engaged on Government work need apply.—Apply your nearest LABOUR EXCHANGE, quoting 5923, ELECTRICAL REVIEW.

WANTED, a competent Electrical Mechanic; experienced in operating gas, steam, and electrical plant; workshop and drawing office experience indispensable; must be ineligible for military service.—Applications, stating present employment, accompanied by copies of three recent testimonials, to 5929, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Electric Wiremen.—Reply, giving full particulars to 766, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Shift Engineer used to single-phase.—Apply, stating age and experience, to WOKING ELECTRIC SUPPLY CO., LTD., Chobham Road, Woking. 5938

WANTED, an electrical engineer to take charge of driving and lighting plant (steam driven) on gentleman's estate during the absence of the present engineer, who is called up for military service; applicants must be ineligible for the army.—Apply to A. C. LESLIE, Newton-le-Willows, Lancashire, giving particulars of experience and wages required. A single man preferred. 732

WANTED, for duration of war, a good Wireman, used to all systems of wiring; and for meter inspecting; ineligible for military service.—State wages to 725, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, for large hotel on South Coast, Assistant Electrician. Must be exempt from military service, and thoroughly understand management of D.C. Dynamos, Motors, Switchgear, Telephones, Bells, and up-to-date practice in steel-tube wiring. Wages £2 per week and board.—Reply, stating age and experience, and copies of three references, to 5826, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Man to look after public lamp circuits, clean, help with batteries, and make himself generally useful; pay, 35s. weekly. Ineligible for military service.—Apply, giving particulars of age, if married, experience and references, to BOROUGH ELECTRICAL ENGINEER, Mansfield. 5847

WANTED, Man for house wiring and connections and for fixing and maintaining hired motors.—RUSHDEN & DISTRICT ELECTRIC SUPPLY CO., 25, Bridge Street, Northampton. 702

WANTED, Repair Hand for Electrical Apparatus, Dynamo, Motors, &c. State experience, age, &c. No person engaged on Government work will be engaged.—Apply your nearest LABOUR EXCHANGE, quoting No. A2044. 5892

WANTED, Fitter-Electrician for small station in country town in Worcestershire; for taking sole control; £2 week.—Apply by letter, PARSONS, 63, Parade, Leamington Spa. 786

SITUATIONS VACANT.—*Continued.*

WANTED, first-class capable Man for Theatre Electrician, where large generating plant is installed.—5943, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WIREMAN-Electrician required, S.E. London district, used to all classes of lighting installations. Must be ineligible for military service.—788, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WIREMAN Wanted, First-class Man, used to all kinds of tubing and casing. No person engaged on Government work will be engaged.—Apply your nearest LABOUR EXCHANGE, quoting No. A2045. 5893

WORKING Engineer to take charge of Suction Gas Generating Plant, Dynamos, Batteries, &c. Wages £2 5s. week.—5936, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SITUATIONS WANTED.

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ADVERTISER, with 23 years' University, practical and commercial experience, desires responsible position. — 698, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

BUYER desires change, experienced in electrical and mechanical engineering; sound business knowledge and practical training; salary £200.—784, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DESIGNING Engineer, ineligible, with experience in automatic A.C. and D.C. motor control gear and switchgear, seeks responsible position with electrical manufacturing firm. — 787, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer desires responsible position; 18 years' technical, workshop and commercial experience. — 747, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer, expert (28), discharged service, wants charge or responsible position.—16, Oval Road, Croydon. 5886

ELECTRICAL Engineer (ineligible), 20 years' technical and commercial experience, good organiser, desires position as Manager to central station or other responsible position.—720, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer now disengaged; many years' experience lighting, power, traction, E.T.H. (3-phase), steam turbines, &c.; has held responsible position in large power station; moderate salary. — 734, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer, over military age, desires responsible position. Experienced in Lighting and Tramways. Thoroughly conversant with maintenance and overhaul of Diesel Engines (10 years' experience).—753, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer (24) desires permanency, ineligible, good central station experience, turbo-alternators, Babcock, Lancashire boilers; experienced certified wireless; good organiser, disciplinarian. Any branch, home, abroad, war service preferred. Disengaged September.—738, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN, capable, all-round man, to supervise: maintenance, erecting, repairs; City preferred.—778, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN, competent all branches, 20 years' experience.—M., 687, Wandsworth Road, S.W. 775

ELECTRICIAN, lighting, power, 'phones; best refs.; ineligible.—W., 33, Brookmill Road, Deptford. 791

ENGINEER (25), 4 years' college, degree, desires engagement; first-class drawing office and design office experience; also operation; good references; ineligible.—742, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

EXPERIENCED Electrician-Wireman disengaged; ineligible; good references; start at once.—783, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOREMAN Electrician (certificated) requires situation; 25 years' practical experience in complete installations; all systems wiring, engines, dynamos, motors, batteries. Could advise on new or old installations.—771, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

GENTLEMAN (26) desires change. Finally rejected. Eight years electrical profession; salesmanship, clerical, and stores experience, both London and provincial. Good testimonials. Will call on applicants in London. Government berth preferable.—780, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

JOINTER, good all round; own plumbing; good refs.—T. POULTER, 85, Newland, Northampton. 697

(Continued on next page.)

SITUATIONS WANTED.—*Continued.*

JUNIOR Shift Engineer and Electrician (age 17½), experienced in running gas and steam engines, D.C. station, desires similar position; disengaged. Wages about 25s. — HURRELL, Anchorage, Cliffsea Grove, Leigh-on-Sea. 5941

MANAGING Electrician (installations and general work) desires change. Finest references, character and ability. Can introduce good customers.—755, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

PIPE-FITTER or good mate wants work; rate 9d.—W. S., 2, Freshwater Place, Marylebone. 782

PRACTICAL Engineer and Electrician desires berth; charge of plant; S. or S.E. Counties preferred. Excellent references.—C. STRUDWICK, c/o Hetley, Soho Square, W.C. 776

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TRAVELLER (42), possessing ability, initiative, first-class established connection amongst architects, electrical contractors, engineers, tramways, manufacturers, &c., desires representation good firm, London or Provinces. Moderate salary, commission, expenses.—777, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WIREMAN, young, experienced, wants job; army discharge.—A., 349, Fulham Road, Chelsea, S.W. 790

AGENCIES.

DRAWN-WIRE METAL LAMPS.

LIVE Agents wanted for London and Cities throughout Great Britain (where representation still open) for new non-Conference Lamp, possessing own glass and cap works, and made under English patents with British capital and labour. Listed below ring prices. Must furnish proofs of sound lamp connection. Liberal terms. Exclusive area in approved cases.—5934, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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A BOMBAY house (India), established in 1903, with large showrooms, is now open to negotiate terms of agencies of high-class and reputed manufacturers of dynamos and motors, switchgear, cables and wires, incandescent, carbon and metal filament lamps and fittings, heating and cooking apparatus, fans, accessories, &c.—5850, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AGENCIES wanted for Cables, Conduits, D.C. and A.C. Motors, by firm having offices in London and Provinces with travellers having connections among Central Station Engineers and the trade.—739, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineers and Merchants, with large connection and Showroom in Glasgow, are open to accept Agencies for Electrical Specialities.—Full particulars to "AMPCOL," Wm. Porteous & Co., Glasgow. 5922

GENTLEMAN, calling regularly on London Station Engineers, wishes to hear from Engineering Firms who want their goods introduced and pushed. Lines required:—Wires, Machine Tools, Lamps, Oils, Motors, &c.—749, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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FOR SALE.

250-KW. Steam-driven Generating Set, consisting of 10-pole, compound-wound "British-Schuckert" generator, 500/550 volts, D.C., 510 amps., 150 R.P.M., direct-coupled to vertical inverted triple-expansion engine, by J. & H. McLaren, complete with rope-driven condenser, spare armature, and switchboard panel.

Compound windings of above may be removed or cut out easily, and set run shunt at 440/490 volts.

This Plant may be inspected at Swansea, must be loaded within 7 days, and on this account will be sold at an extremely low price.

WESTERN ENGINEERING COMPANY,
Swansea. 5769

FOR SALE.—*Continued.*

FOR SALE.

Complete Power Plant.

TWO 500-KW., 500-volt, 50-period, Three-phase Turbo-Alternators, complete with Condensing Plant, Motor-driven Pumps, elaborate Switchboard and quantity of Steam Pipe.

All in splendid order.

Price £2750.

Blue prints and all information on application to:—

THE CALEDON ELECTRICAL CO.,
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FOR SALE.

CROSS-Comp. Hori. Corliss Cond. Engine, by Ruston Proctor, 20″ and 35″ cyls., 42″ stroke.

Tand. Comp. Hori. Cond. Engine, by Yates & Thom, with 16″ and 25″ cycls., 3′ 6″ stroke.

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40-B.H.P. Robson Gas Engine and Suction Plant, magneto ignition.

34-B.H.P. Robson Gas Engine and Suction Plant, magneto ignition.

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18-KW. Diesel Oil Engine, direct coupled to Generator, 500/550 volts, 235 revs.

25-KW. Direct coupled Generating Set, two-crank Comp. engines, 100 volts, 250 amps., 450 revs.

CATALOGUE of Stock MACHINERY. 2-3000 LOTS.
Free on Application. Inspection invited.

THOS. W. WARD, LTD., ALBION WORKS,
Tel.: "Forward, Sheffield." SHEFFIELD.

R. H. LONGBOTHAM & CO., LTD., WAKEFIELD,

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Tel: { 44 Wakefield. / 867 Newcastle. } Telegrams: "Engineer, Wakefield."

FOR SALE.

ONE Parsons Steam Turbo Set, 3500-KW., 1200 R.P.M., with alternator field-rotating type and exciter complete; 6000-volt maximum load, 40 cycles; condensers and three-throw type air-pump, driven by three-phase motor.

350-KW. Alternator, by the B.T.H. Co., 550 volts, 3-phase, 50 cyles, with Barclay's cross compound horizontal Engines, 26″ and 40″ cyls. × 4-ft. stroke.

Two Generating Sets, comprising 350-I.H.P. Triple-Expansion Engine by Belliss & Morcom, and 250-KW. 4-pole Dynamo by Bruce Peebles & Co., 463/550 volts, with condenser, switchboard, &c., &c.

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200-KW. Generating Set, Engine by Belliss & Morcom, Ltd., cyls. 8″ and 14″ × 9″ stroke, and Siemens Dynamo, compound wound, 500 volts, 380 R.P.M. 5277

SELECTIONS FROM STOCK.

750-KW. Willans-Parsons Steam Turbo Set, 440 volts, 25 cycles, 3-phase.

250-H.P. Gas Engine by Crossley Bros., Ltd.

45-KW. Generating Set, 440 volts D.C.

300-H.P. Sandycroft Motor, 220 volts D.C.; also 170-H.P., 160-H.P., 125-H.P., and smaller sizes, same voltage.

175-H.P. Phœnix Motor, 440 volts D.C., 120-H.P., and smaller sizes, same voltage.

Every description of high-class plant in stock at our works for immediate delivery.

HARRY H. GARDAM & CO., LTD.,
Staines.

Telegrams: "Gardam, Staines." 5681

FOR SALE.—*Continued.*

BULBS FOR SALE.

BULBS, for immediate delivery, high quality Japanese, with best English Filaments, 16s. 9d. per 100 net.

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A NUMBER of Direct and Alternating-current Motors for sale, ⅛ to 1 H.P.; some new, some little used.—BRITISH VACUUM CLEANER CO., LTD., Parson's Green Lane, S.W. 713

DICK, Kerr Motor, 50-H.P., 440 volts, 1,200 R.P.M.—MARTINS, 320, Witton Road, Birmingham. 657

DYNAMOS, 3000, 1500, 1000 and 750 amperes at 6 volts, ready for delivery; also smaller sizes delivered from stock. Machines let out on hire.—CANNING & Co., Electro-Platers' Engineers, Birmingham. 7769

ELECTRIC Motors and Dynamos, Sale or Hire. Always a large stock of nearly new guaranteed machines. Immediate delivery.—ELECTRO-GENERATOR CO., 1A, Shepherd's Bush Road, W. 'Phone: 488 Hammersmith. 649

ELECTRICAL Fan for sitting-room or bedroom to be disposed of; also small motor for pump under ½-H.P.—Apply to L. MCKENNA, Honeys, Twyford, Berks. 767

ELECTRICAL Outfits for Lighting, X-Ray work, &c., for hospitals, camps, cinemas, country houses, &c. A speciality: New and guaranteed secondhand oil engines, dynamos.—Write us, WHEATLEY'S OIL ENGINE WORKS, Leeds. 5882

FIFTEEN Switchboards for sale, cheap.—Seen at MARTINS, 320, Witton Road, Birmingham. 656

FOR Sale, Cable, 19/17, 7/18, 7/20, 7/21½, 7/15, lead-covered and armoured; 19/16 lead-covered; 2-H.P. Motor, 100 v.; 10-H.P. Motor, 200 v.; Dynamo, 220 v., 40 a.; Dynamo, 110 v., 55 a.; Motor, 50 H.P., 3-phase, 50-period, 220 v.; Steam Generating Set, Compound Engine, 8 and 14 × 9 stroke; Dynamo, 130 v., 185 a.; also Switchboards and various fittings.—RICKABY, Bloomfield Engine Works, Sunderland. 774

FOR Sale, one 5-H.P., three 3-H.P. D.C. Motors, all 220 volts, and one 3-H.P., 110 volts.—Can be inspected at JONES BROTHERS (HOLLOWAY), LTD., 338/366, Holloway Road, N. 785

FOR Sale, Evershed's Ohmmeter and Generator, £7. Enlisted.—ASBERY, Carlisle Road, Sheffield. 754

FOR Sale, 300-B.H.P. Diesel Engine coupled to 110-volt Dynamo, complete with all accessories; first-class condition.—5918, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, Parker shunt-wound, 4-pole, enclosed Dynamo, 100 volts, 40 amps., ring oilers, disc pulley, perfect condition, complete with switchboard, £29. Also a Parker dynamo, 470 volts, 40 amps., with switchboard, in splendid order; can be converted for motor. Price £50 the two.—COOK, 5, Elton Road, Bishopston, Bristol. Telephone, 757. Telegrams, "Exhaust, Bristol." 5930

FOR Sale, 80-KW., 220-volt Generating Set, £285; 100-H.P., 220-volt, 3-bearing Motor, with spare armature, £200. Up-to-date plant.—5802, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, 65 and 100-H.P., 230-volt "Brookhirst" Type Motor Panels, cheap.—ELECTRICAL STORES, 40, Broomielaw, Glasgow. 5804

FOR Sale, 140 yards 61/13 V.I.R. Cable; also quantity other sizes, &c.—ELECTRICAL STORES, 40, Broomielaw, Glasgow. 5805

FOR Sale, large quantity Switchboards, single, double and triple-pole switches, instruments, starters, resistances, transformers, &c.—ELECTRICAL STORES, 40, Broomielaw, Glasgow. 5806

FOR Sale, two 5-H.P. Self-starting 3-phase Motors, 220 volts; unused.—STEREOPHAGUS PUMP AND ENGINEERING CO., LTD., 39, Victoria Street, London, S.W. 764

FOR Sale or Hire high class Dynamos, Motors, Alternators, Cable and Arc Lamps.—PERCY HUDDLESTON & Co., 72, Finsbury Pavement, E.C. 460

FOR Sale, 100-KW., 500-volt, 50-period, 3-phase Alternator, by Lancashire Dynamo Co., complete with direct coupled exciter and switchboard, £200.—CALEDON ELECTRICAL CO., 2, Oswald Street, Glasgow. 5859

FOR Sale, 120-KW., 500-volt "Browett-Lancashire Dynamo," Generating Set, and 70-H.P., 500-volt Motor; price, £500 the lot.—CALEDON ELECTRICAL CO., 2, Oswald Street, Glasgow. 5860

FOR SALE.—*Continued.*

FOR Sale, two nearly new 18-H.P., 500-volt, enclosed Motors, by Phœnix Dynamo Mfg. Co., £55 each; also 15-H.P., 400-volt ditto, £47.—CALEDON ELECTRICAL CO., 2, Oswald Street, Glasgow. 5861

FOR Sale, 150-H.P., 440-volt, 50-period, 3-phase Motor, by Lancashire Dynamo Co., £160; also several smaller.—CALEDON ELECTRICAL CO., 2, Oswald Street, Glasgow. 5862

FOR Sale, nearly new, 500-K.V.A., 400-volt, 50-period, 3-phase Alternator, with direct-coupled exciter, £550.—CALEDON ELECTRICAL CO., 2, Oswald Street, Glasgow. 5863

FOR Sale, 15-KW., 220-volt, Generating Set, comprising vertical steam engine, direct coupled to 4-pole, compound wound dynamo.—Price £60.—CALEDON ELECTRICAL CO., 2, Oswald Street, Glasgow. 5864

FOR Sale, 220-KW., 500-volt, 400 R.P.M., multipolar 3-bearing, compound wound generator, with slide rails and spare armature. Would make good 250-H.P. motor. Price £350.—CALEDON ELECTRICAL CO., 2, Oswald Street, Glasgow. 5865

FOR Sale, several motor-driven blowers, D.C. and A.C. Cheap.—5857, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale by Tender.—Complete Plant comprising: Two 75-KW., 230-volt, Generating Sets, with Switchboard, Babcock Boiler, Steam Fittings, Pumps, &c.; and a number of Motors.—Further information on application to 5874, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, 400-KW., 480-volt, Generating Set, complete with condenser.—5876, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, 30-KW., 220-volt, and 90-KW., 110-volt Generating Sets, with Belliss Engines; also number of 110-volt Motors, Switchboard, &c.—5875, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, two 21-H.P., 460-volt, 840 R.P.M., semi-enclosed shunt-wound Motors, complete with starters, £60 each.—PHŒNIX ELECTRICAL CO., 40, Broomielaw, Glasgow. 5901

FOR Sale, 80-KW., 220-volt, compound-wound Generator, with spare armature.—5902, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, nearly new, 65-volt, 65-ampere direct-coupled Petrol or Paraffin Set (Kelvin Engine), £60.—PHŒNIX CO., 40, Broomielaw, Glasgow. 5903

FOR Sale, complete House-Lighting Plant: 1½-KW. Dynamo, Oil Engine, Storage Battery, &c., cheap.—5904, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

GAS-Engine Generating Set, direct coupled, 65-KW., 500 volts, suitable for town or producer gas; engine 85 H.P., Stockport; dynamo by Westinghouse. Would sell engine and dynamo separately. Very low price and ready for immediate delivery.—JENNINGS, West Walls, Newcastle-on-Tyne. 5520

GENERATING Sets, direct current.—One 275-KW., Belliss-Kerr, 480-550 volts; three 120-KW., Belliss-G.E.C., 460-500 volts; two 100-KW., 460-550 volts, with new spare armature; one new 68-KW., Belliss-G.E.C., 220-volt; one 60-KW., 110-volt, Scott and Mountain, Boilers Lancashire type; two 30×9 ft. Dank's make, 120 lbs.; two 20 × 7 ft., Oldham Co. makers, 100 lbs.; two 7×3 ft. 3 in. vertical, 80 lbs.—Apply, FRANK GILMAN, Lightwoods Hill, Birmingham. 704

GENERATOR, D.C. compound wound, by Scott & Mountain, 220 volts, 450 amps., 550 R.P.M., slide rails and rope pulley; Switchboard (main), for above three slate panels, complete with meters, switches and fuses, All above recently in use and in good condition. Generator, D.C. compound wound, by Holmes, 115 volts, 135 amps., 650 R.P.M., in good condition. Bargains to quick buyers.—C. HORNE & Co., Electrical Engineers, Middlesbrough. 769

GLASS Boxes for Sale. 55—11″ × 13¼″ × 14″ high. 55—12½″ × 13½″ × 14″, inside.—710, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

NEW 39-ft. span overhead 15-ton Travelling Crane, maker, Morris, Loughborough, ready to load.—Apply, FRANK GILMAN, Lightwoods Hill, Birmingham. 706

ROYCE Dynamo, 141 amps., 220 volts; cheap.—MARTINS, 320, Witton Road, Birmingham. 654

SINGLE-Phase Motor, 30 H.P., 200/250 volts, 50 periods, 750 revs., with liquid controller.—5947, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

STOCK of an Electrical Engineer to be Sold by Tender in Northampton.—For further particulars and inventory apply to MESSRS. ALFRED ANDREWS & SON, 52, Wood Street, Northampton. 5910

11-H.P., enclosed, shunt Motor, 440 volts, 700 revs.; by Newtons, almost new, with switches.—WILDISH, Paignton. 772

(Continued on next page.)

FOR SALE.—*Continued.*

13-H.P. Shunt-wound Motor, 460 volts, 765 R.P.M., complete with starter and ammeter; 5½-H.P. Shunt-wound Motor, 480 volts, 1250 R.P.M.—GATH ELECTRICAL ENGINEERING CO., Halifax. 5855

20-H.P. Motor, 220 volts D.C., 850 revs., made by Electric Construction Company. Pulley 12″ diameter × 6¾″. Starter in cast-iron case. Motor has not been used, and starter is in first-class condition. Price £50.—THE JANDUS ELECTRIC CO., LTD., Hartham Road, Holloway, N. 5917

20-H.P. Verity, totally enclosed, 440 motor and starting gear. MARTINS, 320, Witton Road, Birmingham. 5913

25-H.P., 200 and 400-volt starters; new, direct, protected, automatic release, renewable contacts. 75s. each.—781, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

60-H.P., 500-volt Siemens Interpole Motor; used three weeks. —MARTINS, 320, Witton Road, Birmingham. 5912

100-KW. set, Belliss & Morcom compound engine. C.I.E. generator, 220/235 volts, Davey-Paxman locomotive type boiler.—708, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

160-H.P., 5000-volt, 25-period, 3-phase Motor.—Particulars and price on application to 5803, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

440 VOLTS to 120 volts Motor-Generator complete, 32 KW.—5946, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

460-volt D.C. Motors, 1½, 2, 7½, 8½ B.H.P.; good condition.—5944, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

550-volt, 115-K.V.A., 50-period, 3-phase Alternator and Exciter.—5945, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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ACCUMULATORS wanted for refining purposes. Obsolete Generating Sets, Dynamos, Motors, and all kinds of Machinery. Scrap Cable, Arc Lamps, Meters, Metal Residues, and Scrap Metals of every description purchased for prompt cash, town or country.—Apply A. BROWN & SONS, 142, Lower Clapton Road, London, N.E. Telephone, Dalston, 555. Telegrams, Secondhand, Lowclap, London. Established 1860. 42

A.C. and D.C. Motors (second-hand) any type, any condition, wanted for prompt cash.—A. LEAROYD & SON, Bridge Works, Heatherley Street, Clapton, N.E. 683

A.C. MOTORS, single-phase, 100 or 200 volts, 50 periods. Several required, ½ to 4-H.P., any condition. State particulars and cash price.—RENTON & DAVIS, Electrical Engineers, 39, Flora Street, Plymouth. 792

A. LEAROYD & Son, Bridge Works, Clapton, N.E.—Telephone: Dalston, 2278; Telegrams: Frangible, Lowclap, London—buys for prompt cash every description of secondhand Generating Sets, Accumulators, Motors, Transformers, old Arc Lamps, Meters, Cable, Scrap Metals, Metallic Drosses, &c., &c. Enquiries solicited. Established over 50 years. 684

ARTICLES WANTED.—*Continued.*

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DYNAMOS Wanted, one 50-volt, 12 amps. lcompound; others 50/70 and 100/140 15 to 20 amps. shunt wound.—WHEATLEY'S OIL ENGINE WORKS, Leeds. 5881

OHMER Insulating Testing Set.—J. W. RUSSELL, Loates Lane, Watford. 751

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SMALL Gear Hobbing Machine wanted, to cut plain and spiral pinions up to 40 mm. diameter.—Send details and price to E. T. COOK, The Klaxon Co., Ltd., 38, Blandford Street, Baker Street, London, W. 779

WANTED, good second-hand Motors, 5-H.P., 440 volts, and 3-H.P., 220 or 440 volts, shunt wound, D.C. Full particulars and prices and where to be seen.—PARSONS, King Edward Street, Hull. 758

WANTED, one 50/60 KW. Direct-Coupled Compound Steam Engine and Dynamo, 230 volts D.C.; also two 30/35 B.H.P. Motors with Starters, 230 volts D.C.—Reply, giving full particulars, price, condition and where seen, to 762, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Motor and Regulator, ½ H.P., D.C., 240 volts, 900 revs.; known make, perfect condition.—763, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, 60 to 70-KW., 220-volt Generator.—MARTINS, 320, Witton Road, Birmingham. 773

WANTED, 2-H.P., 200-volt, 50-period, single-phase, slip-ring type motor. Complete, with starter and rails.—Full details and price to 5856, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, one 420-volt, 20-H.P. Motor, compound wound; also two 230-volt, 30-H.P. Motors, compound or interpolar.—ALBERT E. REED & CO., LTD., Bridge Mills, Maidstone. 5878

WANTED at once, mining-type 50-H.P. Motor, 3-phase, 50 periods, 3300 volts.—EAST BRISTOL COLLIERIES, LTD., Kingswood Collieries, St. George, Bristol. 716

WANTED, Generating Sets, all sizes, Boilers, Accumulators, Dynamos, &c., for export; also Scrap Cable and Metals. Complete plants purchased.—WILLIAMS & SONS, 37, Queen Victoria Street, London. Telephone, 3938 City. 7000

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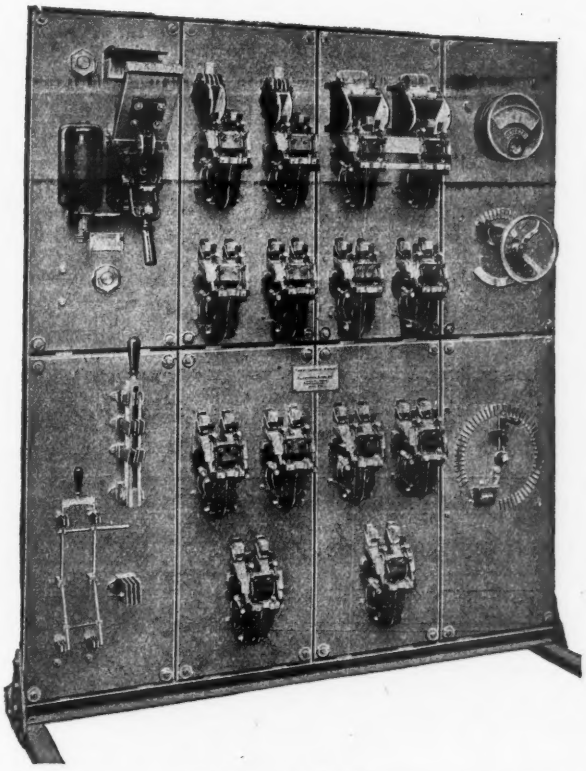

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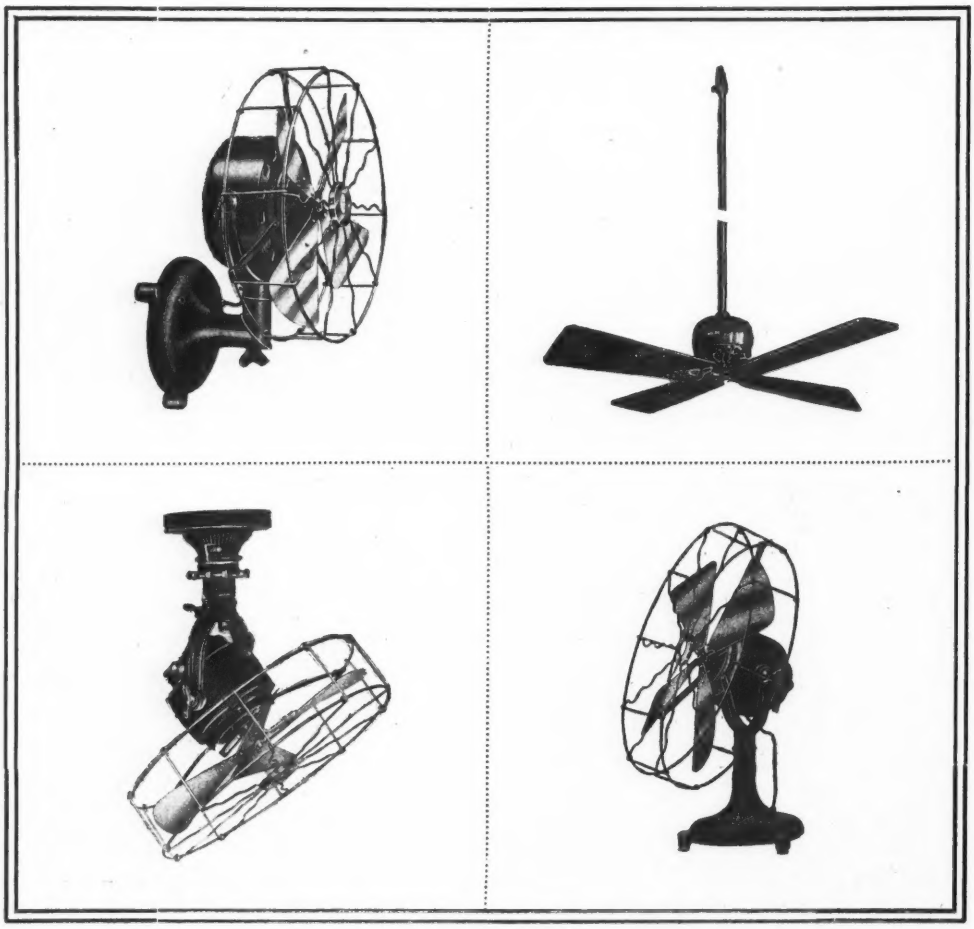

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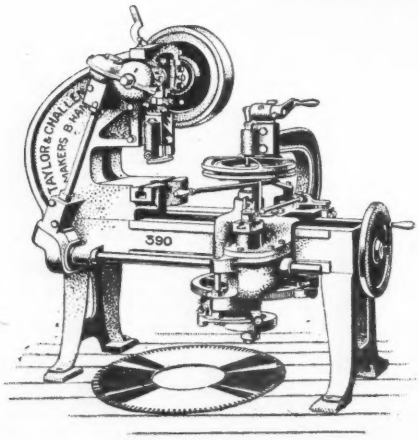

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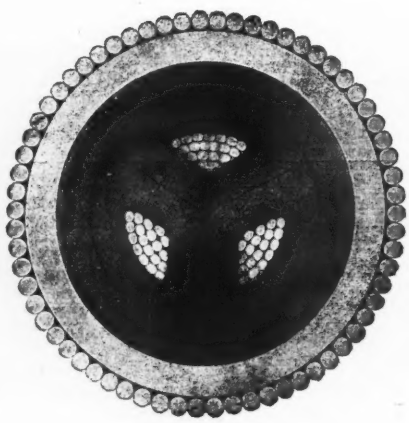

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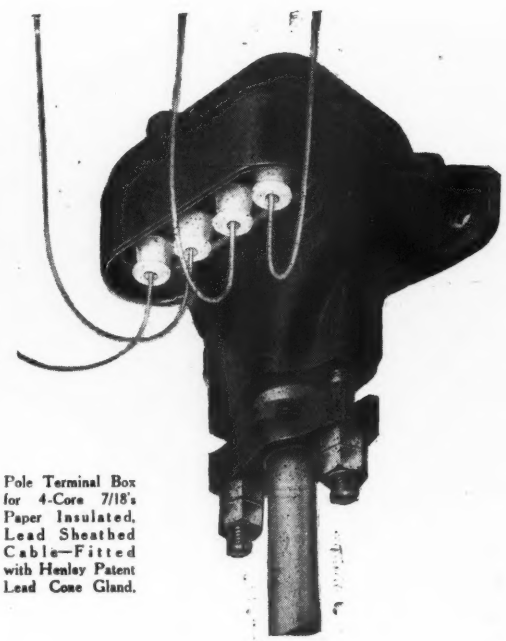

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7, Hummum Street, Bombay.
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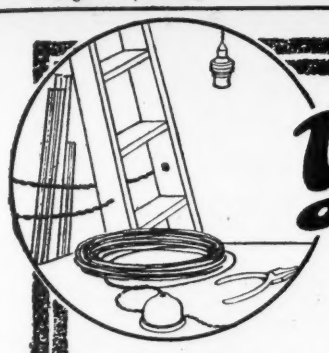

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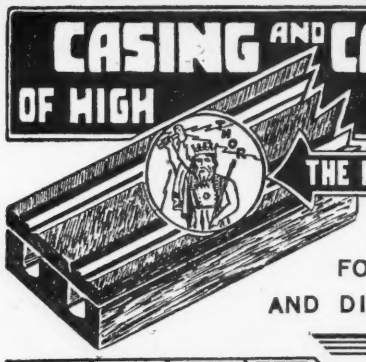
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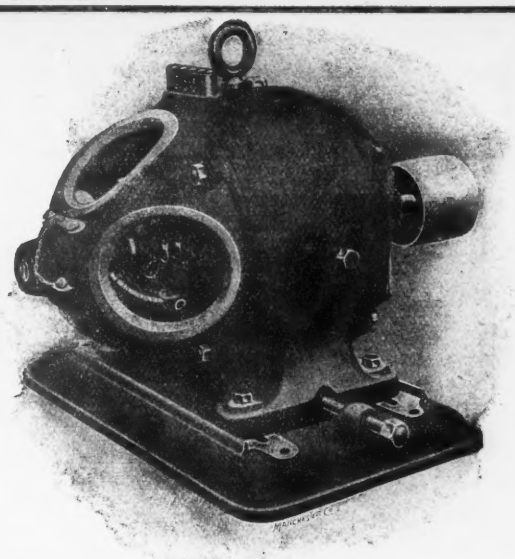

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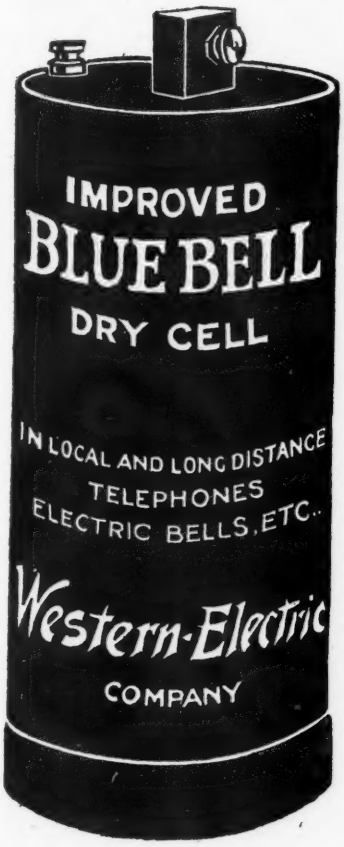

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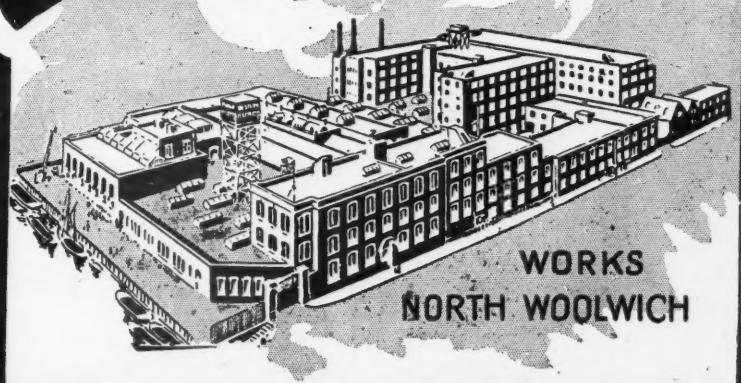

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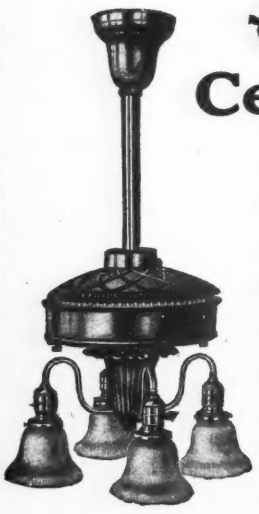

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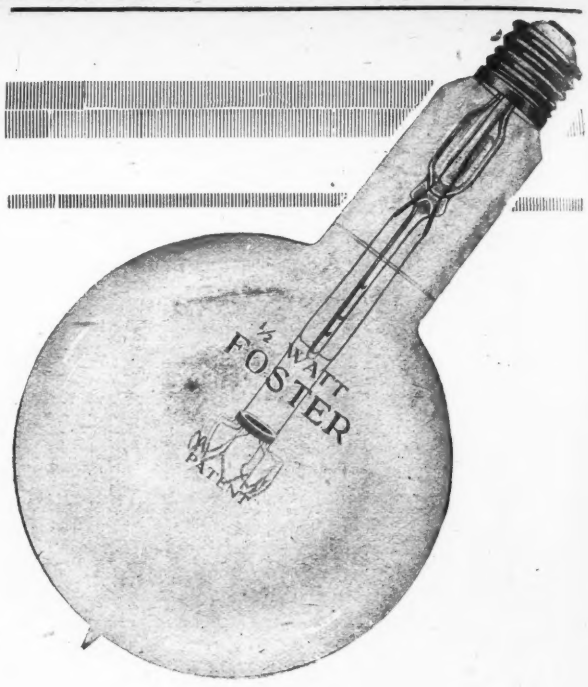

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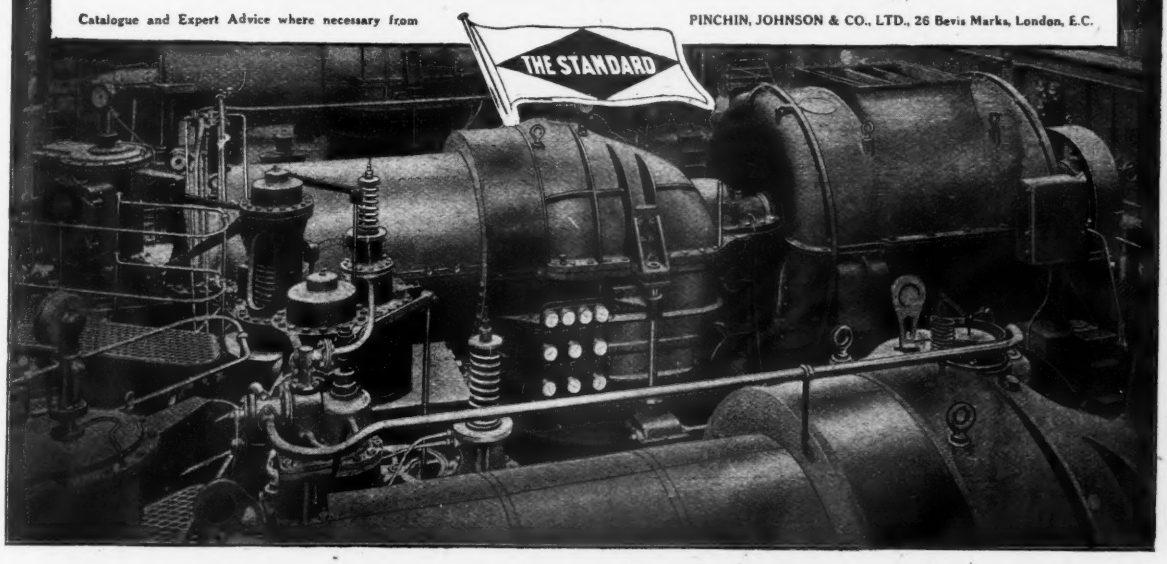

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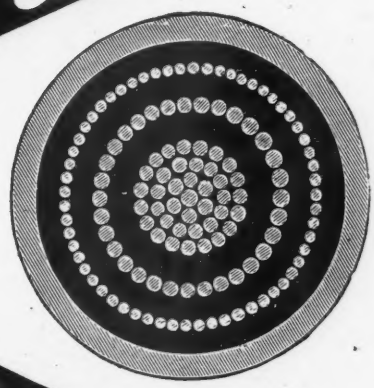

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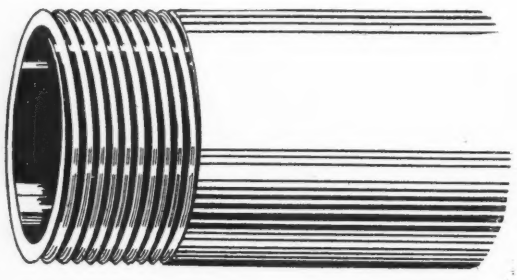
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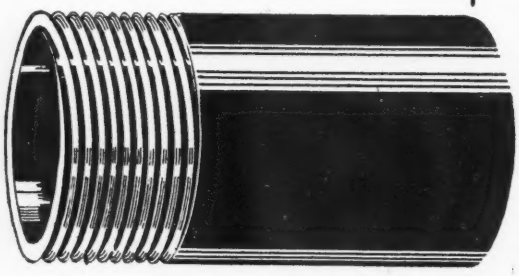

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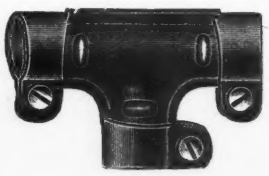

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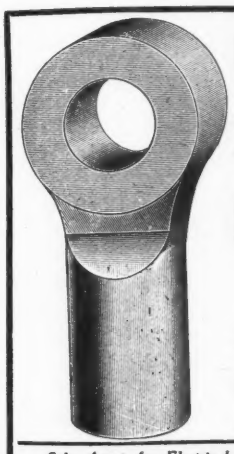

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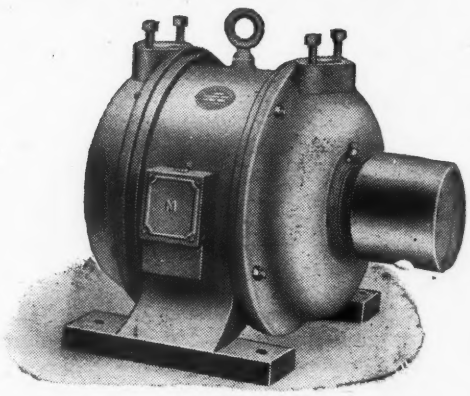

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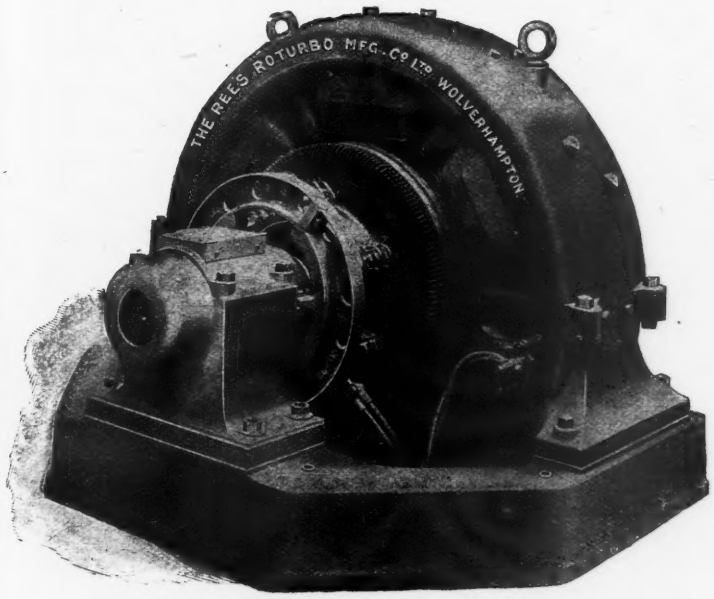

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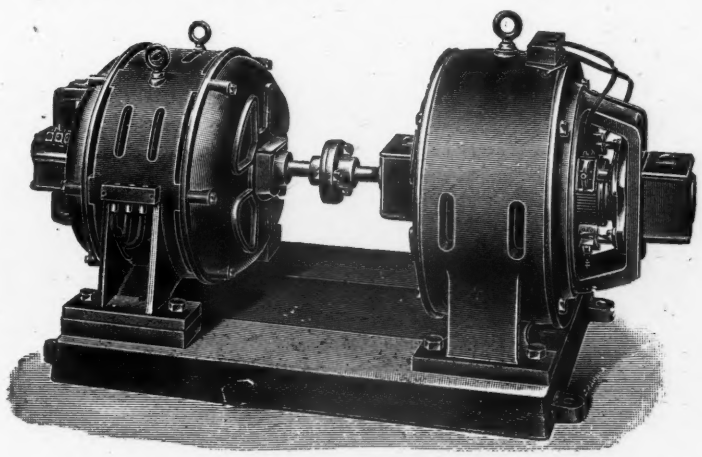

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Telephone: 2240 (3 lines). Telegrams: "Commutator, London"

Bristol: 37, Victoria Street. Glasgow: 44, Robertson Street.
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'IGRANIC'

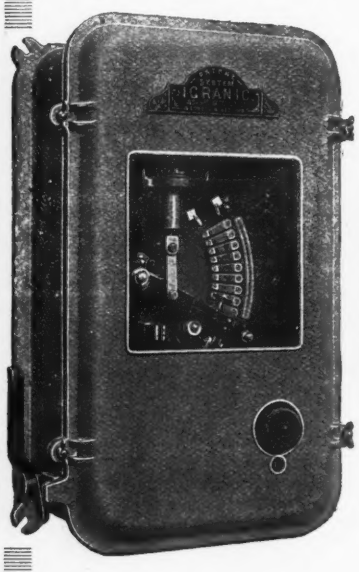
Speed-Setting Automatic Control Panels

FORM a wonderfully efficient unit for controlling such machines as Printing Presses, Boring Mills, Milling Machines, &c.

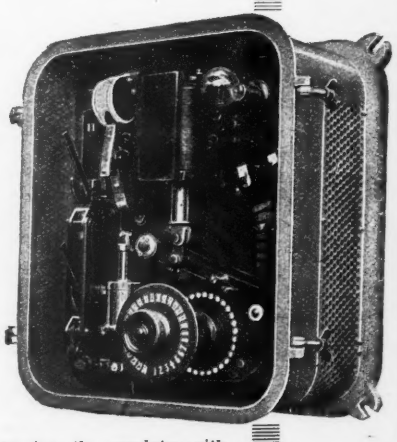
THEY combine a self-acting Starter (controlled from the machine by "Start" and "Stop" Push-Buttons or Master Switch) and a hand-operated Regulator for varying the speed by means of field control. This field regulator is used for pre-determining or setting the speed of the motor before starting. It is interlocked with the Self Starter in such a manner that upon pressure of the start button the motor will accelerate to this pre-determined speed. The operator can thus start and stop any number of times without having to re-set the regulator. The speed can also be altered while the motor is running by merely turning the handle of the regulator.

THESE Panels have proved very popular and are to be found in a great variety of machine shops and printing works; they are thoroughly efficient, well-built and protect the motor in every way.

WHEREVER they have replaced hand starters and regulators they have proved a sound investment—and by increasing the output have repaid their first cost in a surprisingly short time.



The Ironclad Case can, when desired, be fitted with lock and key, with the regulator handle inside, thereby allowing only the foreman to set or alter the speed of the machine. The handle on the left projecting through the side of the panel controls an interlocked double-pole main switch for isolating the control and motor.



Interior view, showing the regulator with dial plate numbering each step, the solenoid-operated starter with retarding dashpot, the magnetically-operated circuit-breaker, which always makes and breaks the circuit, and hand-operated double-pole main switch.

The "Start" and "Stop" Push-Button. Any number of these can be fitted on the machine at convenient points

IGRANIC ELECTRIC Co LTD

147, Queen Victoria Street, London.

30, Cross Street, MANCHESTER. **Works: BEDFORD.** **50, Wellington Street, GLASGOW.**

Printed by WILLIAM CATE, LTD., 147-150, Gt. Saffron Hill, Charterhouse St., E.C., and Published by the Proprietors, H. ALABASTER GATEHOUSE & Co., 4, Ludgate Hill, London.

domestic requirements, the company being safeguarded by the excess charge. It is found in practice that a 3.6 KW. range rarely exceeds a demand of 2 KW. One advantage of such a rate is the incentive to long-hour use, with corresponding improvement in load factor; the company is also secure of a certain income in advance, a consideration which has met with appreciation on this side. Any discussion of electric water heating in this country usually raises the bath-water bogey; but it would appear that there is scope for water heating on a small scale for cooking purposes in conjunction with the electric stove, using the throw-over switch arrangement, so that the water heater or the stove is always connected to the supply; if in addition the limited KW. demand and excess charge system adopted by the Wilmington and Philadelphia Co., or its equivalent, could be incorporated, it is possible that the long-hour load resulting would justify a low average price per unit.

LEGAL.

STEALING ELECTRICAL GOODS.

AT the Mansion House Police Court, on the 28th ult., Stanley Arthur Keeley, 26, clerk and stock-keeper, and Wm. John Dupoy, 42, carman, were charged before Mr. Alderman Moore with stealing and receiving, on July 20th, from 16, Queenhithe, Upper Thames Street, a quantity of electrical appliances, value £7 10s., the property of the General Electric Co., Ltd. Keeley was charged further with stealing an electrical table cloth and plugs, and an electric standard and other articles, value £110. In consequence of complaints of the loss of electrical appliances from the company's premises, observation was kept by the police, and on the 20th ult. the defendant Dupoy was stopped as he was in the act of driving away in a van in which a number of stolen articles had been placed by Keeley, who had been three years in the employ of the company. Both men were arrested. At Keeley's address the police found a number of electrical appliances, including an electric table cover and an electric standard lamp. When shown the property, Keeley said, "These are articles I have stolen, and Dupoy has taken them away for me."

JOHN WM. JONES, storekeeper to the General Electric Co., 71, Queen Victoria Street, said the articles contained in the list produced by the police were the property of the company, and were of the value of £110 17s. 9d. Keeley admitted that he had stolen the articles during the past 18 months.

MR. SAMUELSON, on behalf of the firm, said though these robberies were a serious matter, having regard to their previous good characters, they did not wish to press the case unduly against the men.

Keeley was sentenced to three months' hard labour, and Dupoy to one month's hard labour.

BUSINESS NOTES.

Trade Openings in Italy.—From the British Chamber of Commerce for Italy, at Genoa, we have received further lists of firms who formerly did business with German and Austrian houses, and are now seeking British connections. We select the following:—

No. 1,075. Representative at Genoa can place belting, industrial oils, high-speed steel, machinery, packings for engines, motors, electrotechnical materials, pumps, tubes, measuring apparatus, saws, &c. (S.G. & A.S.)

No. 1,085. Agents at Turin require engineering articles, machine tools, metals, tools, hardware, lights. (T.E.O. & C.).

No. 1,088. Engineer, with office at Cagliari and Rome, would act as agent for electrical, scientific, and telephonic apparatus.

No. 1,108. Merchant at Como would buy glassware, porcelains, earthenware, articles for electric, gas and petroleum illumination. (C.C.E.)

Trade Tour in Spain.—A movement to improve our trade with Spain has been started by the Foreign Office. In Spain there is probably a good opportunity of replacing many German by British products, and arrangements are being made for representatives of British industries to spend a month visiting the principal commercial towns of Spain. The Foreign Office suggests that the party should not be too large, that it should as far as possible consist of actual partners of large firms, and that the trades concerned should agree upon a joint representative rather than send a member of each firm. The object would be rather to lay the foundations of better relations and to discuss the questions applicable to a whole trade than actually to secure immediate orders. Mr. Gonzales y Gordon, a Spanish subject, who is strongly recommended to the Department, will assist in making arrangements, and possibly will accompany the party. The tour will be unofficial.—*The Times Trade Supplement.*

In connection with the above we may be permitted to draw our readers' attention to a leading article in the ELECTRICAL REVIEW for May 8th, 1908, on "British Electrical Enterprise in Spain." We there quoted with approval the suggestion of Vice-Consul Jackson that the "Institution of Electrical Engineers, or some other representative combination of British manufacturers," should take steps to investigate the Spanish market. We proposed that the Electrical Manufacturers' Association should take action. May it not come to that even after eight years?

Book Notices.—"Polyglot Rubber Trade Directory of the U.S.A. and Canada." 1916. New York: *The India Rubber World*. Price $3.50.

"Science Abstracts." "A and B." Vol. XIX. Part 7. July 25th, 1916. London: E. & F. N. Spon, Ltd. Price 1s. 6d. each net.

"Alternating Currents." Vol. II. By A. Russell. Price 15s. net. Cambridge University Press.

The Telegraph and Telephone Journal. Vol. II. No. 23. August, 1916. The Editing Committee: G.P.O. North.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXXV. No. 7. July, 1916. New York: The Institute.

"The Air Supply to Boiler Rooms of Modern Ships of War." By R. W. Allen. Bedford: From the Author.

Bankruptcy Proceedings.—R. E. CONNOLD, electrician, Canterbury.—A first dividend of 3s. 4d. in the £ is payable August 23rd, at the offices of Corfield and Cripwell, 119, Finsbury Pavement, E.C.

Catalogues and Lists.—FOSTER ENGINEERING CO., LTD., Wimbledon, S.W.—Several new illustrated price-lists dealing with various manufactures, as follows:—No. 101A: Half-watt lamp cases for positions where ornamentation or decoration is of consequence; No. 101B: Foster half-watt lamp cases for industrial lighting, munition factories, yards, &c.; No. 102A: The "Wimbledon" half-watt lamp case, solid copper, oxidised, for either outdoor or indoor service; No. 141: Foster drawn-wire metal filament lamps for motor-car lighting, pocket lamps, hand lamps, &c.; No. 140: Foster drawn-wire lamps of various shapes, styles, &c.

MESSRS. JOHNSON & PHILLIPS, LTD., Charlton, S.E.—Three new illustrated lists, giving detailed drawings and particulars, as follow:—JB 1, dealing with sealing ends of British white-glazed porcelain for use with and without rubber ends; JB 2, relating to colliery boxes, and cable accessories for mining work; and JB 3, showing inverted pole-type trifurcating boxes.

MESSRS. DYER & YOUNG, Stansted, Essex.—A catalogue, which takes an unusual form, has been issued. It consists of eight large sheets with metal top and bottom edging, the whole caught together at the top, so as to form a roll. Each sheet shows a number of clear drawings of standard tramway controller fingers of different types, including B.T.H., W.H., Brush, D.K. and others, also segments, &c.

For Sale.—MESSRS. WHEATLEY KIRK, PRICE & CO., the agents for the Controller appointed by the B. of T., invite tenders by August 28th, for the stock of electric lamps, accessories, office furniture, &c., of Krupka & Jacoby, Ltd.

By order of the Controller appointed by the B. of T., Mr. E. Owers will offer for sale by auction on the premises on August 30th, the stock-in-trade, office furniture, &c., of Isaria, Ltd., 208, Tower Bridge Road. Particulars appear in our advertisement pages to-day.

Dissolutions and Liquidations. — ANGLO-COLONIAL ENGINEERING CO., LTD.—This company is winding up voluntarily, with Mr. G. E. Corfield, Balfour House, E.C., as liquidator. A meeting of creditors was held on August 7th.

MILLER ANTI-FRICTION METAL CO., LTD.—This company is winding up voluntarily, with Mr. A. Hennings, of 3, Gore Street, Manchester, as liquidator. Creditors must send particulars of their debts, &c., by September 8th. A meeting of creditors is called for August 15th.

INSTITUTE OF INDUSTRY (OF GREAT BRITAIN AND IRELAND), LTD.—This company is winding up voluntarily, with Mr. L. W. Hawkins, Basildon House, E.C., as liquidator.

BIDDLE AUTOMATIC SIGNAL, LTD.—A meeting is called for September 8th, at 25, Victoria Street, S.W., to hear an account of the winding-up from the liquidator, Mr. W. Braby.

Copper Prices.—Messrs. F. Smith & Co. and Messrs. James & Shakespeare report: August 2nd.—No changes in prices quoted last week.

LIGHTING AND POWER NOTES.

Abercarn.—The B. of T. has extended the period under the Extension Order of 1915 (Abercarn Electric Lighting Order, 1914), of the South Wales Electrical Power Distribution Co. by one year.

Aberdeen.—NEW PLANT.—The Electricity Committee recommends that a new turbo-generating set for the electricity station be purchased from Messrs. Parsons. The Committee reports that the units generated in June showed an increase of 243,620 compared with the same month last year.

Argentina.—FUEL SHORTAGE.—The town of Bahia Blanca is threatened with the cutting off of the electric light, owing to the lack of coal. The local company endeavoured to obtain petroleum from the Minister of Agriculture, offering to pay current official prices, but without success; the trials made with wood fuel have not proved satisfactory. The stock of fuel was expected to last up to the 16th of last month, when the service would have to be suspended.—*Review of the River Plate.*

Atherton.—Linking-up Proposal.—The Electricity Committee has had under consideration the proposed linking-up with the Lancashire Electric Power Co.'s system for the extra supply of electricity required for the district, which it is estimated will involve an expenditure of about £800, and has decided that the Council should agree with the South Lancashire Tramways Co. to pay half the cost of carrying out the work, with the amount stated as the maximum.

Barking.—Revised Charges.—The U.D.C. has amended the charges for current for power and heating to 1½d. per unit for 8,001 to 80,000 units per month, plus a war increase of 5 per cent.; 80,001 to 200,000 to 1⅛d.; beyond, 1d. Subject to a loan being sanctioned, power is to be supplied to the works of the Cape Asbestos Co. for the term of three years.

Belfast.—Year's Working.—The Tramways and Electricity Committee reports a profit of £17,492 on the electricity department on last year, partly due to the sale of a million additional units. It is proposed to give the usual £5,000 to the relief of rates. The tramway accounts show a profit for the year of £7,860.

Canada.—The Hydro-Electric Power Commission has completed arrangements with the Pine River Light and Power Co. whereby all of the transmission lines, sub-station equipments and a portion of the apparatus at the development at Hornings Mills will be taken over and utilised as a portion of the Eugenia system. These lines will be used to serve Shelburne, Orangeville and Hornings Mills, and these municipalities are already being supplied with hydro power by the amalgamation of the two systems, and preparations are being made to serve the municipalities of Grand Valley and Arthur by using the portion of the line purchased from the Pine River Light and Power Co., and by constructing approximately 12 miles of new line.—*Canadian Electrical News.*

The Thomson-Porter Cataract Co. is reported to have submitted plans to the Canadian Government, for a 2,000,000-H.P. hydro-electric development below Niagara, which will not disturb the Horseshoe and American falls, and will cost $100,000,000. A charter has been asked for to construct in the rapids below the falls an international dam to raise the water 100 ft.; half the power would belong to Ontario and half to New York.—*Elec. World.*

According to the Canadian *Electrical News*, work has been started on the Bay of Fundy tide power project at Cape Split, N.B., by the Cape Split Development Co. We referred recently to the demonstration of an experimental tide motor which it is proposed to employ on this site.

Chesterfield.—Proposed Works Extensions.—The proposal to transfer the electricity works from Brampton to a larger site has been considered by the T.C. Mr. S. L. Pearce, of Manchester, advised that it would be better to remain on the present site, and application has been made to the L.G.B. for authority to carry out the proposed extensions: in the event of this being obtained, the scheme for extensions will be submitted to the full Council for approval.

Darlington.—At a Council meeting last week, the electrical engineer reported an increase of 33·96 per cent. in the number of units generated during the three months ended April 1st.

Dawlish.—Price Increase.—The Electricity Co. has applied to the U.D.C. for permission to increase its charges for current to private consumers by 10 per cent., until such times as prices of stores again become normal. The Council has agreed to the request.

Dewsbury.—A Sub-Committee is to consider the proposed agreement with the Yorkshire Electric Power Co. for the supply of electricity to Ravensthorpe. A special tariff is to be provided for those consumers who are not eligible for the rateable value system:—Lighting at the usual rates, and heating or cooking to be on a flat rate of ¾d. per unit (plus the increased percentage in force), and such consumers must guarantee a minimum of at least £2 per half-year for heating and cooking, and adhere to this system for at least 12 months.

Elland.—Price Increase.—The Electricity Committee has decided to advance the price of current from 4½d. to 5d. per unit, and the rate for power by 7½ per cent.

Exeter.—Year's Working.—The report of the city electrical engineer, Mr. H. D. Munro, on the working of the electricity undertaking for the year ended March 31st, shows that the total revenue was £20,472; expenditure amounted to £12,753, leaving a gross surplus of £7,719; sinking fund and income-tax charges absorbed £7,597, leaving a net surplus of £122. The increased price of coal and the loss in revenue of £524 due to lighting restrictions, and the increased charges for income-tax, interest, and sinking fund, absorbed nearly the whole of the gross surplus. Owing to the economical working of the new steam turbo-alternator during nine months, there was a decrease of 368 tons in coal consumption, although 49,000 additional units were generated, also a saving of £120 in the costs of oil and water. The consumers increased by 100, and the power demand by over 240 H.P. £2,474, the costs for mains extensions, and £785 for accessories for the new turbine, were paid out of the reserve and renewal funds, as the T.C. was not permitted to draw on the loans sanctioned for these purposes.

Frome.—Street Lighting.—On account of restricted lighting the public lighting account of the U.D.C. has been reduced by £250 by Messrs. Edmundson, the contractors.

Gelligaer.—The Board of Trade has extended the time by one year under the Gelligaer (Bedlinog and Fochriw) E.L. order 1914.

Hale.—An end has been made of the negotiations by the Farnham R.D.C. with the Gas and Electricity Co., with reference to a supply of electricity for Hale, owing to the restrictions imposed by the Treasury upon expenditure, making it impossible for the mains to be extended whilst the war lasts.

Hereford.—On account of the diminished consumption of current, due to the operation of the Summer Time Act, the T.C. has decided to levy a minimum charge of 10s. per quarter in cases where not more than 20 units are used.

India.—The Madura Municipal Council held a special meeting recently, at which Mr. K. T. B. Tressler, the Director of Industries, Madras, explained the attitude of the Government on the subject of introducing electric lighting into the municipality. At present it would not be possible for the Government to take up the Periyar scheme, and it was necessary that the Council should have its own scheme. The total cost would be nearly a lakh of rupees, and would provide for 2,500 25-C.P. lights and 200 fans. Mr. Tressler is to advise the Council how to proceed with regard to the matter.—*Indian Engineering.*

It is stated that the Tata Co. is engaged on a further 40,000-H.P. hydro-electric scheme, the head works of which will be 10 miles from those of the existing hydro-electric scheme. The company undertook to supply 40,000 H.P. to Bombay from the latter, and 30,000 H.P. is already being delivered, while, were all the mills electrified, it is considered that Bombay could absorb 100,000 H.P.—*Financier.*

Leigh.—Colliery Supply.—The Westleigh Colliery Co. is to be informed that the Corporation is not prepared to allow the Lancashire Electric Power Co. to supply it with electricity, but that the Corporation is prepared to give a supply on terms to be agreed upon between the company and itself, and, failing such agreement, on terms to be fixed by the B. of T.

London.—Hammersmith.—Year's Working.—The annual report of Mr. G. G. Bell, the borough electrical engineer, for the year ended March 31st, points out that the undertaking is one of the few where the rates charged for electricity are still maintained at pre-war figures, and that a net profit of nearly £600 was earned. Owing to the lighting restrictions, and the disappearance of units purchased and resold, the total sales, 11,178,294 units, show an increase of only 1,461,042 units, compared with the previous year; but the units sold from the Hammersmith generating station show an increase of 2,000,018, entirely due to the power load. The most important item in the accounts, with the exception of the capital charge, is fuel, the cost of which has increased in two ways; first, by the increased initial cost; and, second, owing to large consignments being carted to the generating station from railway sidings instead of being delivered at Chancellor's Wharf.

The cost of pumping coal from Chancellor's Wharf by means of coal-pumping plant, and handling same, is only 4·57d. per ton. The saving that would have been effected if the whole of the coal delivered at the sidings (11,390 tons) had been pumped, would have been £391. The cost of cartage from sidings being £1,054, and the cost of pumping 11,390 tons at 4·57d. per ton, plus 9d. per ton for delivery by barge, would have been £663. The total cost of cartage would have been further increased if the coal-pumping plant (which is now in successful operation) had not been installed; 6,872 tons of coal were pumped during the year at a cost to the department of £57 for electrical energy used by the plant. With the coal tanks in use no trouble was experienced, as in previous years, from the coal stock catching fire.

The total units generated were 13,271,640; only 1,461 units were purchased. The maximum demand was 5,980 KW., and 971 motors of 9,126 H.P. are connected to the mains. The total revenue was £64,117; works cost and special expenditure amounted to £39,488, and gross profit to £24,629; while the net profit was £595, as compared with £3,717 in the previous year.

Marylebone.—At the meeting of the B.C., on July 27th, the report on the working of the electricity undertaking for the year ended March 31st last was presented. During this period 16,069,870 units were sold, as compared with 15,926,167 units in the previous year, decreased lighting consumption being more than counterbalanced by increased requirements for heating and cooking. The total income amounted to £182,772, an increase of £13,555; after meeting working expenses, &c., the net revenue balance was £122,192, from which the usual loan charges were met, leaving a net profit of £2,371, as against a deficit of £7,057 in the previous year. Ald. Duncan Watson, chairman of the Electricity Committee, explained the figures in detail, pointing out that generation costs had increased by 27 per cent., but distribution and management costs had decreased by 22 and 20 per cent. respectively, while taxes, &c., were up 6 per cent. The Sales and Publicity Department showed a credit balance of £479. A satisfactory linking-up arrangement with the Central Electric Supply Co. had been entered into; he had himself handled the matter of the quinquennial assessment, and the Committee came out "on top." He concluded by intimating that, owing to his private position, it had become necessary for him to resign the chairmanship of the Committee, an announcement which was received with general expressions of regret by the Council.

Maidstone.—The T.C. has decided to supply the works of Messrs. Amies & Son, at an estimated cost for mains of £120, and to apply for the electricity works to be declared a controlled factory.

Oldham. — Two-Rate Consumers and "Summer" Time.—It was mentioned at a meeting of the T.C. that the Electricity Committee had over 2,000 clocks in use in connection with meters, the hands of which had not been advanced on the adoption of summer time. Councillor Dixon said there was dissatisfaction among electricity consumers who were on the two-rate system as they were charged two different scales, and complained that they had been "done out" of an hour at the lower rate. Councillor Hardman (chairman of the E.C.), said they could not possibly, in the limited time allowed, alter the 2,000 clocks. If the new system were permanent something would have to be done, and some means would have to be found of dealing with the matter.

Perth.—Price Increase.—From the estimates of the electricity department it appears the rate of charge for ordinary consumers will be increased by 15 per cent., the trade rate by 7½ per cent., and the tramway rate by 7½ per cent.

Shrewsbury.—Price Increase.—Owing to increased costs in connection with the electricity undertaking, it has been necessary to increase the charges to consumers by 20 per cent.

Year's Working.—The annual report of the electricity undertaking for the year ended March 31st last shows a total income of £9,136, working expenses amounting to £6,519, and a gross profit of £2,616. After payment of interest and sinking fund charges, there was a deficit for the year of £972, which was taken from the reserve fund. The total capital expenditure is £60,733, and the outstanding debt, less sinking fund, £24,594.

Skelton and Brotton.—The Council has decided not to accede to a request by the Cleveland and Durham Electric Power Co. to pay a higher price for the current supplied to the Council for its electric supply undertaking.

South Africa.—The Somerset West (Cape Province) installation was formally inaugurated recently by the switching on of the supply at the transformer kiosk, near the railway station, the Mayor performing the ceremony. The supply is derived from De Beers' explosive works at Somerset Strand, about three miles from the village of Somerset West. The consulting engineer for the scheme is Mr. Charles G. Trevett, who is at present with the Motor Transport Corps in East Africa, and the contractors are Messrs. Herbert Davies & Co.

The new electric light installation at Worcester (Cape Province) was recently completed, and formally opened. The consulting engineer for the installation is Prof. Bohle, of the South African College, and the contractors Messrs. Siemens, Ltd.

The Boksburg (Transvaal) Council has decided to dispose of its generating plant, and has accepted the offer of the British South African Explosive Co. of £7,500 for the same, excluding two pumps and motors.

Stalybridge.—Extended Supply Area.—At a special meeting of the Stalybridge Joint Electricity Board, consideration was given to the question of granting supplies of current to prospective customers outside the present area of supply, and it was decided to empower the Generating Station Committee to proceed with the work for the supply of current in the extended area described in Clause 37 of the Board's Act of 1915.

Stockport.—Proposed Loan.—Subject to B. of T. consent and L.G.B. sanction to a loan, the Electricity Committee proposes to buy certain premises for £2,700, and to use the land for an electricity generating station. An alteration in the proposed minimum charge for current has been made to 30s. per annum, payable 7s. 6d. per quarter, and where the units consumed in any quarter do not amount to 7s. 6d., the unconsumed units are to be carried forward to the following quarter, but not beyond a complete year. It is believed that this will meet the complaint of those who use very little current in the summer.

Stockton-on-Tees.—Bulk Supply.—At a meeting of the T.C. last week (August 1st), it was stated that a portion of the present steam plant at the electricity works was to be shut down until November next, consequent upon an agreement having been entered into with the Cleveland and Durham Power Co. with regard to the supply of electricity. Under the agreement with the company, the Corporation is bound to pay for a minimum of 1,000,000 units per annum, with a reduced charge on all energy in excess of 1,750,000 units, providing that the maximum demand does not exceed 1,000 kw., and 500 kw. during certain restricted hours. Under the new arrangement the Council's generating plant will be under steam for only 782 hours per annum, as against 7,500 hours formerly.

Stoke-on-Trent.—Extensions Approved.—The Council has approved of the proposals of the Electricity Supply Committee to carry out extensions of plant at the central power house, in respect of which a loan of £12,000 has been sanctioned by the L.G.B.

Thirsk.—Street Lighting.—The Electricity Co. has written to the P.C. with reference to the lighting contract for next season, offering to keep the necessary plant ready to supply requirements providing the cost, about £115, is met by the Council, and £1 a year paid for each lamp used. The matter is to be placed before the ratepayers.

Torquay.—"Summer-Time" Effects. — The deputy electrical engineer has reported that before the passing of the Summer Time Act the daily demand was 350 kw., with an output of 2,820 units, now the daily demand was 275 kw., with a daily output of 2,010 units. The engineer stated that new connections were making good the losses due to the Act and public lighting restrictions.

Trowbridge.—Price Increase.—The U.D.C. has consented to the charges for current supplied by the Electric Supply Co. being increased by 10 per cent. for the duration of the war.

Turton (near Bolton).—Year's Working.—Reporting on the past year's working of the electricity undertaking, the electrical engineer states that units sold to private consumers numbered 27,011. The total revenue from private consumers was £339, compared with £305. The total number of units purchased was 43,397, compared with 58,133 in the previous year, the decrease being due to the reduction of public lighting. There were now 67 consumers connected, 23 new ones having been added during the year.

Warrington.—Price Increase.—The T.C. has agreed to the price of electric current (except where otherwise provided) being increased 5 per cent. as and from August 1st, 1916, on the existing scales of charges.

Weybridge and Walton.—Price Negotiation.—As an outcome of the recent negotiations, the U.D.C.'s have sealed agreements with the Electric Supply Co. by which, for the duration of the war, the price of current will be 7d. per unit on a flat rate; six months after the war ends, if the circumstsnces do not render it absolutely impossible, the price is to be reduced to 6d.

TRAMWAY and RAILWAY NOTES.

Blackburn.—The tramway manager reports a profit of £1,479 on the Corporation tramways for the quarter's working ended June 30th.

Chile.—The electrification of the Valparaiso and Santiago Railway is being considered, and a law authorising the Government to invite tenders has been passed by the Senate.

Gateshead-on-Tyne.—The Town Improvement Committee recommends the T.C. to rescind its consent to the proposal of the Gateshead and District Tramways Co. to double the track on the Bensham route. The Committee also recommends the appointment of a Committee to confer with the Newcastle Corporation Committee with regard to running cars across the High Level Bridge between Gateshead and Newcastle. There was some discussion as to the desirability of entering into negotiations with Newcastle-on-Tyne on the subject, but eventually the report was adopted.

Glasgow. — Wages.—The Tramways Committee has decided not to recommend the granting of a war bonus of 6s. per week to motormen and conductors, but has agreed that employés could have the option of working six extra hours per week overtime at time-and-a-half rates.

Keighley.—The period for the completion of the overhead equipment of railless trolley route (C), under the Keighley Corporation Act, 1912, has been extended by one year.

London.—L.C.C.—The week ending August 2nd was a record one for the Council's tramway undertaking, the traffic revenue amounting to £52,300; during the week 729,177 children travelled at reduced fares.

Manchester.—Alderman Bowes (chairman of the Tramways Committee) stated at a recent meeting of the City Council that the military hospital authorities did not favour anything in the way of a general grant of free travelling facilities on the cars for wounded soldiers. The department therefore issued tokens, and these entitled the wounded soldiers to whom they were handed to travel free of charge.

Oldham.—The Tramways Committee's recommendation of revised charges for the carriage and delivery of parcels by car was referred back at the T.C. meeting last week, so that full details of the charges proposed may be supplied to the Council. Arrangements are contemplated to allow wounded and convalescent soldiers wearing distinctive hospital suits to use the cars free. The Tramways Committee has disposed of some chilled steel car wheels at £1 per wheel more than it gave for them.

Tilbury and Southend Railway Electrification. — The Midland Railway Co. is applying to the B. of T., under the extension of Time Act, to extend until the session of 1917 the time within which it must submit a scheme for railway electrification between Fenchurch Street and Southend to Parliament.—*Railway Gazette.*

United States.—A strike affecting the tramways in New York commenced on Saturday last. The subways and elevated railways were not affected at the time of writing, though cases are reported of tramway cars being attacked.

TELEGRAPH and TELEPHONE NOTES.

Canada.—Mr. Philip E. Edelman, of St. Paul, Minnesota, has been engaged by the Canadian Government as electrical engineer to prepare plans for wireless telephone and telegraph installations in the 7,000 square miles embraced by the Dominion Parks of Western Canada. The object of the installation is to prevent forest fires and game trespassing, by affording an instant means of communication for reporting, and calling for aid, in territory where ordinary means of communication are out of the question.

France.—A special department has lately been established by the French Post and Telegraph authorities in Paris, to conduct experiments in connection with telegraphy and telephony.

Telegraph (Construction) Bill.—In the Committee stage on this Bill, on Monday last, Mr. Pease agreed to substitute three months for one month as the period within which consent should be signified by the owner, lessee, or occupier of any land or building affected by the placing of a telegraph line, and a provision was added that the tribunal to which a difference is referred shall not give its consent to the placing of a telegraph line unless satisfied that the refusal or failure of the owner, lessee, or occupier to consent is contrary to the public interest. The Committee stage was concluded, and the Bill was read a third time.

The Channel Tunnel and Telephonic Communication with the Continent.—The following interesting letter from Prof. J. A. Fleming appeared in the *Times* a few days ago:—"One of the possible utilities of a Franco-British Channel tunnel, which has not yet, I believe, been mentioned, is the increased facility it would afford for direct telephonic communication between Great Britain, France, Switzerland, and Italy. There are at present two English Channel telephone cables, each with twin circuits, which, by the method of usage called phantomising, can be made equivalent to three circuits each. These cables are, of course, subject to the possibility of injury, like all submarine cables, and repairs might be costly and take time. If, however, the Channel tunnel were constructed with proper provision for it, a large number of telephonic and telegraphic cables of a certain type could be laid in it which would afford greatly increased means of intercommunication at a less cost than by equivalent submarine cables. If these were extended by suitable coil-loaded aerial lines, telephonic communication could be established between the principal cities in Great Britain and those in France, and possibly Italy. Having regard to the far closer commercial relations which will exist between the Allies in the post-war period, this improved intercommunication will be of the greatest advantage. I submit, therefore, that in any plans for such a tunnel, ample provision should be made for telephonic and telegraphic cables of the latest type for long-distance working."

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Sydney.—September 20th. N.S.W. Government Railways. One 50-ton electrically-operated overhead travelling crane for Zara Street power house, Newcastle. October 11th. One motor-driven air compressor for Zara Street power house. Electrical Engineer, 61, Hunter Street.

Perth.—October 4th. Deputy P.M.G. Telegraph and telephone measuring instruments and parts. Schedule 501 W.A.*

Barking.—August 15th. Electricity and Tramways Committee. Cables, switchgear, and transformers. See "Official Notices" July 28th.

Blackburn.—August 12th. Steam coal for electricity department for 12 months. Mr. P. P. Wheelwright, Engineer and Manager.

New Zealand.—Invercargill.—September 28th. Borough Council. Steam turbo-alternator, condensing plant, and switchgear. Specifications from the Tramway Office. Contract No. 40.*

St. Asaph.—August 16th. Guardians of St. Asaph Union. Renewal of accumulators. See "Official Notices." August 4th.

South Africa.—Johannesburg.—September 4th. Municipal Council. 10,000 drawn-wire metallic-filament traction lamps; 10 miles of 19/14 "Underwriters' wire" (lightly insulated wire for outdoor use). Contract No. 151.*

September 21st. Municipal Council. Tramcar spares. Contract No. 153.*

Specifications for the items marked * can be seen at the Board of Trade Commercial Intelligence Branch in London.

CLOSED.

Aberdeen.—Electricity Committee. C. A. Parsons and Co. Ltd., 5,000-kw. turbine-alternator with condenser and auxiliaries, £18,858.

Batley.—Accepted tender: Brush Electrical Engineering Co.; spare armature and spare condenser tubes.

Sheffield.—The contract with the British Electric Transformer Co., Ltd., for transformers and series gear is to be extended for a further period of two years, in accordance with a revised schedule of prices.

Tramways Committee. Peckham Truck and Engineering Co., 15 Peckham trucks, at £92 10s. each.

Sunderland.—Electricity Committee:—

B.I. & Helsby Cables, Ltd., cables; Steel & Co., mild steel shoots.

NOTES.

The Metric System in the U.S.A.—Generations of effort by earnest advocates have not served to advance the cause of the metric system in the United States and in some other countries as have the world-war conditions of the last two years. American factories that knew only inches and feet 24 months ago, are turning out millions of shells, rifles, guns, and other war materials entirely in metric dimensions. Scores of railway locomotives are being manufactured by American plants in metres and millimetres, and in entire factories and sections of factories not a single gauge, scale, or other measuring device can be found bearing the complicated Anglo-American measures of length.

The orders in metric terms that are flowing into American factories are not alone for what might be termed primary war materials. In addition to locomotives already mentioned, orders for rails, bridge members, machinery, tools, and even fabrics and wearing apparel, are accompanied by metric specifications. Practically without exception, American manufacturers have adapted themselves to the new requirement.

The experience has been a revelation to many manufacturers, who considered the metric system complicated because they had had no experience with it. Many practical workers have insisted that in spite of the handicap of unfamiliarity it is, in a very short time, a simpler matter to apply the metric system to their work than to use the foot and inch system, with its unwieldy fractions.

The war is helping the cause of the metric system in other ways as well. It has shut off South America and other consumers of manufactured goods from their usual sources of supplies in Europe, and has awakened in American merchants the desire to supply these markets, not only temporarily, but permanently. Practically every one of these possible markets, however, is in a country using only the metric system, to the people of which price-lists in pounds and tons, yards and inches, dozens and grosses, are hopelessly confusing. Furthermore, many of the South American countries require that goods be marked in metric measures before they may pass the Custom houses.

The result of this is that exporter after exporter has recognised the need of making use of the metric system, and has quietly begun turning out two classes of products if he fills both domestic and foreign orders—goods measured and marked in customary units, and others sized and marked metrically. Complicated as such a procedure might appear at first sight, it has proved distinctly profitable in practically all cases in which it has been tried, thus confuting the contention of opponents of the metric system that its introduction would prove expensive.—*Scientific American.*

Our Consular Service.—In the August issue of the *Times Trade Supplement* Mr. De F. Pennefather, M.P., has an informing and suggestive article on the Past, Present and Future of the British Consular Service. He holds that in this department the necessities and outlook are greatly altered by the war, and after giving the history of the development of the Consular Service over a lengthy period, and of the investigations of, and reports made upon, it at different times, he concludes as follows:—

"There should be little difficulty in obtaining all the men required to strengthen our Consular Service. Thousands of men of business experience and proved ability have voluntarily given up good positions, both at home and abroad, in order to join the Army. Many of these must possess all the necessary qualifications—including knowledge of languages—and if they are unable to pick up their former careers at the point they laid them down, may be seeking for new openings. A short training would render such men efficient, and no cast-iron 'regulations' or 'red tape' should be allowed to stand in their way.

"It is obvious that a great deal of consideration will have to be given to the whole question of our Consular Services in the light of recent happenings and future probabilities, and much spade work will have to be done in order to investigate thoroughly many matters in regard to many places, countries, and trades, and to ascertain what our Consuls can most usefully do, and how and where they can best do it.

"The Foreign Office or the Board of Trade cannot do all this during the war, and yet if the work is only begun when the war is over, our competitors may reap great advantages.

"It therefore seems only natural and proper that our Chambers of Commerce, which have for so many years taken an active and intelligent interest in the matter, should collect through their 30,000 members, the results of experiences in all parts of the Globe, and thus furnish material which will help the Government to build up a Consular Service which will not only provide 'better facilities for the maintenance and expansion of the trade of the Empire,' but also carry out generally the objects aimed at by the Allies, as stated in their decisions at the recent Economic Conference in Paris."

Educational.—University of Manchester.—We have received the prospectus of the University courses in the Municipal School of Technology for the coming Session, which opens on October 5th. Prof. Miles-Walker occupies the chair of Electrical Engineering.

The Electrical Trade Position in the United States.—Our contemporary, the *Electrical World*, says that few large orders are being booked for electrical goods. The high cost of construction materials is holding back a large volume of buying. The writer says:—"One of the outstanding features of the present market for electrical goods has been the absence of numerous orders for large quantities of material. To be sure, there have been some large orders, but these have been principally brought on by the boom in metals. Iron and steel rolling mills have bought large quantities of electrical goods in single orders, but they were practically forced to it. But the large development projects scheduled for erection about this time have been held up, wherever possible, until more favourable times. Those plants that are in the course of construction undoubtedly have either been absolute necessities, owing to the condition of the load and the load expected, or else were projected, and orders placed previous to this general advance in prices. All construction costs have advanced many per cent. Labour, besides being more expensive, is very scarce. Copper wire for transmission lines has advanced to an almost prohibitive price, owing to the demand for copper by the warring nations. Practically all electrical equipment, including the necessary steam and hydro machinery, costs considerably more to-day than before the war. Although orders of large volume have been infrequent, there have been many inquiries for quantities of goods that would run into millions of dollars. All of these inquiries, it is more than likely, will develop into *bonâ fide* orders as soon as the price is satisfactory. It is well known that there is a vast amount of railroad electrification awaiting lower prices. One of the large eastern roads has laid plans for extending its electrified zone, but is hesitating to do anything definite at the present time, because of the abnormally high prices. It is significant that the greater part of the buying of electrical goods during the recent months has been by industrial concerns, factories, mills, &c. There is therefore to be expected, it is believed, as soon as prices warrant, a buying movement from the other large purchasers, the central stations and railroads."

Lamp Voltage Standardisation in the U.S.A.—Although in the early years of incandescent lamp manufacture it was impossible accurately to predict before the lamp was manufactured at what voltage it would operate most efficiently, with the introduction of the drawn-wire filament, it became possible to foretell accurately at just what voltage any and all of the output should be rated. Lamp manufacturers, therefore, are now in a position to standardise their output and to bring about economies in the manufacture, distribution, and utilisation of lamps. Among the many benefits which it is expected will accrue from this standardisation of incandescent lamp voltages there are others besides those of manufacture. With a smaller number of sizes, dealers with the same investment naturally will be able to carry lamps for a greater variety of services. Also there will no longer be any necessity on the part of central stations to maintain domestic-service voltages at other odd pressures.

All of the affiliated lamp manufacturers have co-operated in this movement, it is understood, although but one company, the National Lamp Works, will try it out. Should the results justify, it is understood that all of the manufacturers are prepared to adopt the same voltages which, after a careful analysis of the National output, were placed at 110, 115, 120 volts.—*Electrical World.*

Foreign Trade.—The July Figures.—The official returns of imports and exports during last month contain the following electrical and machinery figures:—

	July, 1916.	*Inc. or dec.*	*Seven months*, 1916. *Inc. or dec.*
Imports:—			
Electrical goods, &c.	£128,978	+ £30,730	+ £395,303
Machinery	684,293	− 212,217	− 191,321
Exports:—			
Electrical goods ...	349,967	+ 87,916	+ 639,041
Machinery	1,761,054	+ 45,825	− 348,913

Electric Vehicle Committee.—At a meeting of the Electric Vehicle Committee, held in London on July 28th, it was announced that the Royal Automobile Club had nominated as their representative upon the Committee, Mr. W. Worby Beaumont.

Correspondence has taken place between the B. of T. and the Electric Vehicle Committee on "Import Restrictions," and the Committee has been informed that, providing a statutory declaration is made to the effect that the chassis which it is desired to import are to be used solely for commercial purposes, the matter of their importation will have consideration.

Correspondence with the Car and General Insurance Corporation, Ltd., was submitted, from which it appeared that the corporation were willing to come into line with the suggestions previously made by the Committee that their Standard Electric Vehicle Policy should be altered so as to include the risk on the battery while the vehicle is in transit by road, rail, or ship. Subject to this alteration, the Committee decided to give their approval to it.

The Committee regretted the decision of the Rugby U.D.C. not to provide charging facilities; the British Thomson-Houston Co. are, however, prepared, on certain conditions, to charge electric vehicles passing through Rugby.

The secretary reported the action he had taken in connection with the report made by the borough engineer of Southwark to the Works Committee of the Council, and his action in this matter was approved.

Scottish Engineering Organisation.—A large meeting of Scottish engineering employers, held in Glasgow on August 4th, Mr. Rowan Thomson presiding, passed the following resolution:—

"That in view of the unprecedented situation created by the war and the uncertainty of the future this meeting is of opinion that all engineering firms in England and Scotland should come together under a strong central organisation, capable of dealing with important questions that will certainly arise in the near future; that the existing organisations connected with engineering should also receive whole-hearted support in order that they may be strong to achieve the objects for which they were created."

A committee was appointed to carry the proposal into effect.

Appointments Vacant.—Shift engineer, for the Woking Electric Supply Co., Ltd.; engineer-in-charge, £2, for the Bexley U.D.C.; shift engineer, 35s., for the Neath R.D.C.; charge engineer, 42s., for the Corporation of Wakefield Electricity Department. See our advertisement pages to-day.

A Good Use for Old Tracing Cloth.—One of the minor directions in which engineers can help the war is by collecting all their old cloth tracings or unused tracing cloth and sending them to Lieut. R. D. T. Jones, R.E., Ministry of Munitions, Explosives Department, Storey's Gate, Westminster. The cloth, when boiled, washed, and sterilised, makes excellent bandages, pillow cases, &c., for the wounded—things that are still badly needed. Engineers need have no fear that their designs will be copied, because all the tracings are handed to a responsible person to be treated. Many firms have already helped in this way, and it is hoped that many more will do so.

There are few works that do not destroy dozens of yards of tracing linen a year, and now that this excellent use for the waste material is pointed out to them we feel sure that they will respond to Lieut. Jones's request.

Volunteer Notes.—1st London Engineer Volunteers.—Headquarters, Chester House, Eccleston Place. Orders for August by Lieut.-Col. C. B. Clay, V.D., Commanding.

The Headquarters will be closed during August except on Tuesday evenings. The range will be open on Thursday evenings only. Instruction Classes at Regency Street will be held as usual for Platoons Nos. 9 and 10. The Camp at Otford will be available until August 31st. Members wishing to attend should enter their names at Headquarters.

Sunday Entrenching Parades. Parade in Uniform at Victoria Station (S.E. and C. Railway) Booking Office, 8.45 a.m.

Macleod Yearsley, *Adjutant.*

3rd Batt. (Old Boys') Central London Volunteer Regiment.—Battalion Orders by Capt. W. Ridd (Sub-Commandant), Thursday, August 10th, 1916:—

Week-End Parades.—Saturday.—The Battalion will Parade at Liverpool Street Station (Low-Level entrance, G.E.R.), at 8.40 a.m., and proceed by train for entrenching duties. Members will make their own arrangements for lunch. Those who wish to return to town will reach Liverpool Street Station about 6 p.m. Those who cannot take the early train will parade at Liverpool Street Station (Low-Level entrance, G.E.R.), at 1.20 p.m.

Sunday.—The Battalion will Parade at Liverpool Street Station (Low-Level entrance, G.E.R.), at 9.30 a.m., and proceed by train for Entrenching duties. Members will carry their own lunch, and the Quartermaster will make arrangements for light liquid refreshments. The Battalion will return to town about 6 p.m.

Musketry.—Members who have sent in their names to shoot at Bisley on Saturday, 12th inst., will report, in Uniform, to Sergt. J. W. S. Burmester, at 12.45 p.m., at No. 8 Platform, Waterloo Station.

Recruits will Parade at Lord's Cricket Ground on Saturday at 3 p.m., and on Sunday at 11 a.m., for Recruit Drill.

Wembley Park.—There will be no week-end Parade at Wembley Park.

Clarence T. Coggin, *Acting Adjutant.*

Registration of Business Names Bill.—This Bill passed its third reading in the House of Lords on Wednesday. Lord Southwark informed the House that under the provisions included in the Bill, the commercial community would be able to tell whether any firms included aliens. Amendments were approved providing that nationalities as well as names should be registered, and altering the date for the Bill to come into force from October, 1916, to January 1st, 1917.

The Fall of the Levitated.—Notices appear in the *London Gazette* of Tuesday last to the effect that the following four companies cannot by reason of their liabilities, continue their businesses, and are to be wound up voluntarily, with Sir W. B. Peat as liquidator:—

Bachelet Levitated Railway Syndicate, Ltd.
Bachelet Shipbuilding, Engineering and Ordnance Co., Ltd.
British Bachelet Flying Train Syndicate, Ltd.
Bachelet Shuttle & Loom Co., Ltd.

Board of Trade Inquiry.—The Board of Trade Commercial Intelligence Branch has received an application for names of manufacturers, or producers, of plated metal fronts and reflectors for portable electric hand-lamps.

The State and Science.—The British Science Guild has prepared a memorandum on the relations which should exist in future between the State and science. The memorandum proposes that a national statutory Board of Science and Industry, the permanent staff of which should consist mainly of persons of wide scientific knowledge and business experience, should be established, among other objects to :—

Promote the co-ordination of industrial effort.

Secure co-operation between manufacturers and all available laboratories of research.

Institute a number of paid advisory committees consisting of men of wide scientific knowledge, assisted by expert investigators and technologists, who should receive reasonable fees for their services.

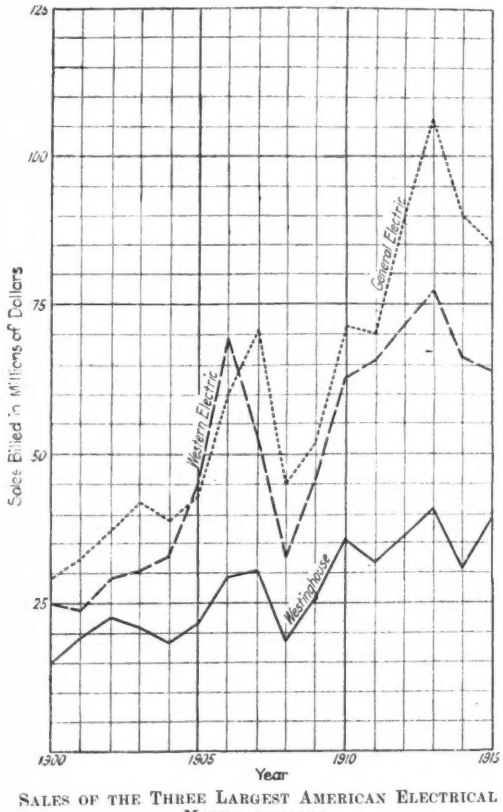
Organise scientific effort on the manufacturing side and in commercial relations with other countries.

Encourage investigation and, where necessary, give financial aid towards the synthesis and artificial production of natural products and for other researches.

The memorandum also urges that the courses at the public schools and at Oxford and Cambridge should be revised ; that more attention should be given to scientific method and to educational handiwork in elementary and secondary schools ; and that a knowledge of science should be essential for certain appointments in the public service.—*The Times.*

Sixteen Years' American Electrical Sales. — During the last 16 years the aggregate sales billed by the three largest distributors of electrical goods in the United States has amounted to $2,191,937,000, or an average of approximately $137,000,000 annually. The total for the General Electric Co. was $963,899,000 ; Western Electric Co., $792,800,000 ; Westinghouse Electric and Manufacturing Co., $435,238,000. The accompanying curves, which are reproduced from the American *Electrical World*, show graphically the annual variation in the sales of these three companies starting with 1900.

It will be noticed that while the general tendency has been upward, the curve for each company contains more than one



Sales of the Three Largest American Electrical Manufacturers.

inflection. Furthermore, in each case it will be noticed that the slump in sales billed followed a particularly good 12 months. In 1907 the sales of the General Electric Co. were the largest on record, but in the following year the sales were almost on a level with those for 1905. Again, the 1913 sales took a jump to $106,477,000, which was almost $20,000,000 greater than any previous year. In 1914 but $90,468,000 worth of electrical goods were sold.

The same condition is true to a different degree of the other two companies except that the Western Electric Co. had a record year in 1906 and a slump in 1907. The 1906 Western Electric sales billed were $69,000,000, and the 1907 sales billed were $53,000,000. The 1913 sales billed were $77,500,000 and the 1914 sales billed amounted to $66,400,000. Sales billed by the Westinghouse Co. in 1907 were $30,325,000, and in the following year $18,216,000. In 1913 they were $40,741,000, and in 1914 but $31,208,000.

In 1911 both the General Electric and Westinghouse Companies billed smaller sales than in 1910, but the Western Electric Co.'s sales increased by $3,000,000. The 1910 sales of the General Electric Co. were $71,479,000 and of Westinghouse $35,622,000. The 1911 sales of these two companies were $70,384,000 and $31,223,000 respectively.

The largest year in the history of the three corporations was 1913. In that year the sales billed by the three companies were as follows : General Electric Co., $106,477,000 ; Western Electric Co., $77,500,000 ; Westinghouse Electric and Manufacturing Co., $40,741,000 ; a total of approximately $225,000,000.

Both the 1908 and 1914 slumps were attendant upon international financial depressions. The year 1907 opened with a liquidating movement following a year of extraordinarily good business. Before the year was ended affairs had reached such a point that credit was suspended, and in America a panic broke out. In this latest depression, says the *Electrical World*, it is not difficult to understand why business should fall off when with the greater part of the civilised world at war and international commerce practically suspended, financial operations were suspended and money was both expensive and hard to obtain.

Women's Working Capacity.—Dr. Carpenter, the chairman of the South Metropolitan Gas Co., told the shareholders, on Wednesday, that the amount of work a woman turned out was about two-thirds that of a man, and, therefore, they paid them two-thirds of the rate paid to men.—*Daily Chronicle.*

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station and Tramway Officials.—The Oldham Corporation has decided to grant an honorarium of £10 to the tramways traffic superintendent for his extra services for three months following the retirement of Mr. Dugdale from the managership, and an increase of salary has also been granted to him. The works manager has likewise received an advance.

Mr. R. B. Leach, electrical engineer and tramways manager of the Heywood Corporation, has been appointed electrical engineer and manager of the Loughborough Corporation at a salary of £300 per annum. There were 95 applicants for the position.

According to a Dublin newspaper, the Dublin Electricity Committee recommends an increase in remuneration to the shift engineers and switchboard attendants. The Committee recommends granting the men the difference between their present salaries and the maximum to which they become entitled according to their respective positions in a few years.

The salary of Mr. S. D. Jones, electrical engineer to the Batley Corporation, has been increased by £15 a year, and that of Mr. Carter, assistant engineer, by £10 a year.

The Malvern U.D.C. is increasing the salary of the gas and electrical engineer, Mr. S. Trow Smith, by £50 per annum.

General.—The directors of the St. James's and Pall Mall Electric Light Co., Ltd., have appointed Sir Alexander B. W. Kennedy, F.R.S., chief engineer in the place of the late Mr. S. T. Dobson, M.Inst.C.E.

Mr. Norman H. Wood has left the submarine department of Messrs. John Brown & Co., Ltd., Clydebank, to take up a commission in the R.N.A.S. as Sub-Lieutenant, R.N.V.R.

Roll of Honour.—The *Times* states that Captain Frank R. Jessup, Border Regiment, killed in action, was born in 1887 and educated at Brentwood and Gordon's College, Aberdeen. On leaving Gordon's he entered the service of the Eastern Telegraph Co., and at the end of 1908 resigned to join his elder brother in Vancouver, B.C. He was engaged in the engineering department of the Pacific Great Eastern Co. when war broke out.

The *Times* states that Captain A. E. Stone, who was killed in action on July 24th, had been connected with Messrs. George White & Co., of Bristol, for about 20 years, and he rendered valuable services on the formation of the London United Tramways Co. He was Sir George White's private secretary for many years

Private Francis Slack, of the Sherwood Foresters, who joined at the outbreak of war whilst engaged at the Derby Corporation electric light station, has died at Edmonton Military Hospital, of wounds received in action. Before going to France he served in Gallipoli for three months.

Sergeant Alexander Ross, of the Public Schools and University Battalion Royal Fusiliers, killed in action in France on July 20th, at the age of 23 years, studied electrical engineering at the Faculty of Technology, Manchester, and received the degree of B.Sc. (Technical) in June, 1914.

Private Ernest Harris, formerly with the South Metropolitan Electric Lighting Co., was killed in action in France on July 19th.

Lance-Corporal Charles Jones, an employé of the Chloride Electrical Storage Works, Clifton, near Manchester, is unofficially reported to have been killed in action, aged 21.

Driver Thomas Finnigan, of the Canadian Artillery, who has died in a casualty clearing station, was a Bolton man. He

emigrated to Canada five years ago with his brother, Edward, and the two were in business in the Dominion as electricians. They enlisted together, and Edward is now in the Canadian Record Office in this country.

Private James Crompton, Lancashire Fusiliers, who is missing, was employed in the overhead equipment department of the Salford Corporation tramways.

Private J. J. Hilton, of the Lancashire Fusiliers, who has been killed in action, aged 32, was an employé in the electrical department of Messrs. Mather & Platt, Ltd.

Sergeant P. J. Harris, of the Royal Warwicks, of Seedley, near Manchester, who was employed by the General Electric Co., Ltd., has died in France from wounds, aged 26.

Sergeant Frank Dawson, of the Manchester Regiment, killed in action, aged 39, was employed by the British Westinghouse Co., at Trafford Park.

Private Charles J. Parry, of Manchester, an employé of Messrs. L. Andrew & Co., Manchester, has been killed in action, aged 30.

Private Stanley Summerscales, of the Leeds "Pals" Battalion, is reported missing. He was in the employ of Messrs. Veritys, Ltd.

Sergeant A. E. Wright, of the Royal Field Artillery, who is an electrician, of East Ham, has been awarded the Military Medal for bravery and devotion to duty.

Rifleman John Lambourne, of the Rifle Brigade, who was an employé at the Rugby works of the British Thomson-Houston Co., Ltd., has died of wounds received in action in France.

Lance-Corporal Montagu Pearson, of the South Staffs Regiment, reported killed in action in France, was employed at the British Thomson-Houston Co.'s works at Rugby. He was 23 years of age, and a year ago was wounded in Gallipoli.

Two employés of the Leyton Municipal tramways department, Messrs. G. Davies and H. J. H. McPherson, have fallen in action in France.

Private Thomas Lovelady Wood, of the King's Liverpool Regiment, who has died at Rouen of wounds received in action, was on the staff at the Formby electric power station.

Corporal A. Richards, Royal Warwickshire Regiment, was killed in action on July 14th.

Second-Lieutenant J. H. C. Chandler, 24th Battalion R.F., who, before joining up in January, 1915, was chief tester at Messrs. Mather & Platt's Park Works, Manchester, was recently wounded in France, and is in hospital at Osborne, Isle of Wight.

Lieutenant J. H. Palmer, who has been killed in action, was educated in France and at the Manchester Municipal School of Technology, and took his degree in electrical engineering at the Manchester University. He was later for several years with the firm of Messrs. Connolly Bros., Ltd., cable manufacturers.

Driver Leonard Mortis, who was an employé of the British Westinghouse Co., Trafford Park, has died in hospital in Mesopotamia. He was 22 years old.

Rifleman Charles G. J. Betts, of the London Rifle Brigade, who is officially reported missing since the great offensive, was formerly in the showrooms of Messrs. Cunningham, Ltd., London.

Driver W. H. Owens, R.F.A., accidentally killed on active service, was formerly employed by Messrs. Downes & Davies, wholesale electrical merchants, Liverpool.

Private Ben Terry, of the King's Own Royal Lancasters, an employé of Messrs. Connolly Bros., Ltd., cable manufacturers, Blackley Vale, has died from shell shock.

Private Arthur Bateman, Manchester Regiment, killed in action, was an employé of the British Westinghouse Co.

Private John Haley, who was employed by the Morley Electrical Engineering Co., Stanningley, before the war, is reported killed in action in France.

Obituary.—Mr. R. I. Longrigg.—Mr. Robert I. Longrigg (38), electrical engineer, of Hoole, Chester, died at the Seacombe Ferry Hotel, being found in his room with a gunshot wound in the mouth. At the inquest it was stated that deceased had been hard-worked and was on the verge of a nervous breakdown, and a verdict was returned to the effect that deceased committed suicide, there being no evidence as to the state of his mind.

Mr. C. W. Curtis.—In the *Times* "Deaths" column it is announced that Mr. Chas. Wm. Curtis, Principal Medical Officer of the Eastern Telegraph and Allied Companies, passed away on August 6th at Ashford, Middlesex.

Will.—The late Prof. Silvanus Phillips Thompson left £8,444.

NEW COMPANIES REGISTERED.

Grinyer & Co., Ltd. (144,531).—This company was registered on August 4th with a capital of £5,000 in £1 shares, to take over the business of electrical and mechanical engineers formerly carried on as Grinyer and Co., at Wakeling Street, Stepney, E. The subscribers (with one share each) are: J. McLaren, 9, Tillotson Road, Ilford, engineer; W. R. Germain, 3, Wakelin Street, Stepney, E., engineer. Private company. The number of directors is not to be less than two or more than five; the first are J. McLaren (permanent chairman) and W. R. Germain. Qualification, one share. Solicitor: F. Budd, Devonshire Chambers, 146, Bishopsgate, E.C. Registered office: 146, Bishopsgate, E.C.

British Revival Manufacturing Co., Ltd. (144,501).—This company was registered on August 1st, with a capital of £1,500 in 1,000 preferred shares of £1 each and 10,000 deferred shares of 1s. each, to manufacture electrical accessories previously made and supplied by enemy countries, and to carry on business in connection therewith. The subscribers (with one preferred share each) are: P. H. Robinson, 72, Shaftesbury Road, Crouch Hill, N., clerk; W. H. Belleine, 120, Clarence Road, Lower Clapton, N.E., jeweller's assistant. Private company. The number of directors is not to be less than two or more than five; the subscribers are to appoint the first. Qualification, 300 shares. Remuneration, £100 each per annum (chairman £150). Secretary (*pro tem*): P. H. Robinson. Registered office: 160, High Road, Chiswick.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Mander & Co., Ltd.—A first mortgage debenture dated July 24th, 1916, to secure not more than £300, charged on the company's undertaking and property, present and future, including uncalled capital, has been registered. Holder: J. E. Bendell, 20, Greenhill Road, Moseley.

Small Electric Motors, Ltd.—Particulars of £3,000 debentures, created July 19th, 1916, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Pitter's Ventilating & Engineering Co., Ltd.—Debenture dated July 20th, 1916, to secure £5,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: H.M. Minister of Munitions, Armament Buildings, Whitehall, S.W.

Compania de Electricidad de la Provincia de Buenos Aires, Ltd.—A trust deed dated July 19th, 1916, supplemental to a trust deed dated November 24th, 1911, to secure an increased rate of interest payable on the amount secured by the principal deed (£900,000), charged on the power distributing and transforming stations in the Argentine Republic and the company's undertaking and property, present and future, including uncalled capital, and all existing and future concessions and contracts, has been registered. Trustees: City Safe Deposit & Agency Co., Ltd.

T. F. Braine & Co., Ltd.—A memorandum of satisfaction in full on July 24th, 1916, of mortgage dated March 1st, 1910, securing £2,000, has been filed.

CITY NOTES.

North Melbourne Electric Tramways and Lighting Co., Ltd.

The report for the year ended September 30th, 1915, just issued, shows that the gross receipts were £33,462, as against £30,438 in the previous year. The expenses were £21,730, against £19,721. The net revenue was £11,732, as against £10,717. The tramways department carried 3,138,327 passengers (against 2,874,021), and 475,017 car miles were run (against 463,293). New lighting consumers connected numbered 316, making the total 1,805. During the year the capital expended was £3,692. The scheme submitted to the debenture-holders and shareholders in June and July, 1916, was adopted, and the necessary adjustments consequent thereupon are incorporated in the present accounts. The amounts written off in exchange for income certificates (issued with the sanction of the Treasury) were £37,575 in respect of arrears of debenture interest, and £16,525 in respect of bills payable, and a further £5,433 has been written off for interest waived by the holders of the bills. The total amount written off is £59,533, out of which the directors have applied £23,000 for depreciation of the company's undertaking, and the balance in extinguishing the debit to profit and loss. The directors have agreed to waive the arrears of their fees amounting to £800. They again express their appreciation of the excellent services of the manager, Mr. Murdoch, and the staff. Annual meeting: London, to-day.

Western Canada Power Co.—The First Mortgage Bondholders' Committee of this company announces that it has approved an agreement of reorganisation formulated by the protective committee for noteholders of Western Canada Public Utilities, Ltd.—*Financial Times.*

Elmore's German and Austro-Hungarian Metal Co., Ltd.—The report for the year ended December 31st shows that, after charging debenture interest, &c., there was a loss of £4,815, thus increasing a debit balance of £21,517 brought down to £26,332.—*Financial Times.*

Oldham, Ashton & Hyde Electric Tramways Co., Ltd.—Interim dividend at the rate of 5 per cent. per annum (6d. per share), less income-tax, on the ordinary shares for the half-year.

Nairobi Electric Power & Lighting Co., Ltd.—Final dividend at the rate of 4 per cent. per annum, less income-tax, on the preference and ordinary shares for the year ended December, 1915.

Kensington & Knightsbridge Electric Lighting Co., Ltd.—Interim dividend on the ordinary shares for the half-year ended June 30th, 1916, at the rate of 5 per cent. per annum.

Paisley District Tramways Co.—Interim dividend at the full rate of 5 per cent. per annum on the preference shares for the half-year to June 30th.

Walter Scott, Ltd.—A further dividend of 10 per cent. is recommended, making 15 per cent. for the year.

STOCKS AND SHARES.

Tuesday Evening.

Stock Exchange markets have dropped into the placid quietude so usually associated with August. Though the Bank Holiday was cancelled, it seems likely, judged from the appearance of the Stock Exchange, that a good many members started what holidays they are able to get this year so as to include the Monday; and apparently, from the number of orders received this week, many of their clients have done the same thing. There is little animation anywhere. Electric Lighting shares are steady, the telegraph market is as firm as ever, British Columbia Railway issues are better, and there is a fair amount of activity in the area of war stocks, this embracing iron and steel companies as well as those concerned with munitions, transport, catering, shipping and the like. The shipping market in particular stands out prominently; and the shake-out which followed the mad upward movement has been succeeded by a swift recovery.

It is a little surprising that the electricity supply section should maintain so noticeable a degree of strength. St. James' shares and Westminsters are both wanted. In fact, the prices for the West End shares are all decidedly good, and there are more buyers than sellers. Counties and Cities remain firm. Although there are no quotable changes in the list, prices are better than they look. The Kensington and Knightsbridge Co. announce an interim dividend of 5 per cent., as against 6 per cent. a year ago.

The Stock Exchange Committee will re-institute next week the system of double quotations where such are practicable. We have already indicated a few of the pros and cons of this endeavour to bring back to pre-war conditions some, at any rate, of the hundreds of securities quoted in the Official List. Whatever may be thought of the scheme—and there are a good many people who doubt its wisdom or utility—the experiment will be an interesting one to watch; and its institution in the dog days will enable it to get into reasonably good running order by the time that Stock Exchange business revives, which it ought to do, in the nature of things, about the middle of September. The immediate nigger in the hedge is the possibility of a further rise in the Bank Rate, which is scouted in many quarters, just as a month ago the idea of the minimum rising to its present 6 per cent. was received with scoffing and ridicule.

The Home Railway market is moving extremely slowly, and when changes occur, they are mostly in the retrograde direction. This is because there is nothing of interest to sustain prices. There are no traffics, reports, meetings to galvanise the position; and though ingenious commentators work out what is going to happen after the war, the future is so obscurely wrapped that it is impossible to accept the estimates as likely to prove reliable, except by chance.

The Undergrounds are firmer than the rest, despite the severe restrictions applied to the use of petrol pressing upon the London General Omnibus services, which, of course, are the really paying part of the Underground group; and the curtailment of omnibus facilities in London affects more harshly the hard-working portion of the community than would the abolition of those monstrosities which tear about the seaside and some of the country districts, packed with rubber-necks. If the authorities were to turn their attention to unessential motor conveyances on land and water, it might force people to use their natural means of perambulation a little more, but, at the same time, it would save petrol for services of more serious import at the present time.

In the telegraph market, Anglo-American preferred has fallen a point, but the deferred is ¼ higher. Great Northerns have recovered their loss of last week, and West India and Panama shares are a little better at 1½. There is a fair amount of animation in Marconis, and buyers have come along at 3⅛, while the Marines keep good at 2¼. Telephone shares are steady, but without alteration.

British Columbia Electric issues are good, with rises of 2 points in the preference and deferred stocks, while the preferred at 45 is 3 up. The financial position in Canada steadily improves, and British Columbia companies are sharing in the increasing prosperity of the Dominion. Just as a little while ago it was not easy to sell the stocks, so now at the present time it is just as difficult to buy them. Brazil Tractions are a dull market at 62, although the Rio exchange keeps very steady. The Argentine group is neglected.

Amongst the manufacturing shares, British Westinghouse preference have partially recovered their decline of last week, and Electric Constructions are again 3d. to the good. British Insulated are a strong market at 12. Babcock & Wilcox have gone back a trifle. The chemical group is good, and rumour once more toys with the names of individual companies which are said to be looking towards one another with the idea of amalgamation or working agreement.

In the armament division, Sheffield has been something of a seller, without, however, producing any quotable change, except in the case of Projectiles, which have gone back a little. Great firmness characterises the rubber share market. The price of the raw material shows a hardening tendency, and so far as shares of the good companies are concerned, it is once more easier to sell than it is to buy them.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1914.	Dividend 1915.	Price Aug. 8, 1916.	Rise or fall this week.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	10	10	6⅞	—	£7 18 2
Charing Cross Ordinary	5	5	8⅝	—	6 18 0
do. do. do. 4½ Pref.	4½	4½	2⅝	—	6 8 7
Chelsea	5	4	3	—	6 13 4
City of London	9	8	12½	—	6 8 0
do. do. 6 per cent. Pref.	6	6	10½	—	5 14 3
County of London	7	7	11⅞	—	6 8 9
do. 6 per cent. Pref.	6	6	10½	—	5 14 3
Kensington Ordinary	9	7	6½	—	6 16 7
London Electric	4	3	1⅜	—	6 10 5
do. do. 6 per cent. Pref.	6	6	4½	—	6 13 4
Metropolitan	3½	3	2⅜	—	6 6 4
do. 4½ per cent. Pref.	4½	4½	3	—	7 10 0
St. James' and Pall Mall	10	8	5½xd	—	6 19 4
South London	5	5	2⅝	—	8 18 10
South Metropolitan Pref.	7	7	1½	—	6 4 5
Westminster Ordinary	9	7	6½	—	5 14 3
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	103	—1	5 16 5
do. Def.	80/-	83/6	23½	+ ½	7 8 9
Chile Telephone	8	8	6½xd	—	5 18 5
Cuba Sub. Ord.	5	5	8¾	—	6 1 3
Eastern Extension	7	8	11⅜	— ⅛	*5 8 6
Eastern Tel. Ord.	7	8	148½	—	*5 7 9
Globe Tel. and T. Ord.	6	7	12½	—	*5 8 8
do. Pref.	6	6	10⅞	—	5 10 4
Great Northern Tel.	22	22	33	+ ⅛	5 15 9
Indo-European	13	13	48	—	6 12 8
Marconi	10	10	3⅛	—	3 4 0
New York Tel. 4½	4½	4½	99⅜	—	4 10 3
Oriental Telephone Ord.	10	10	2⅛	—	5 0 0
United R. Plate Tel.	8	8	6¾	—	*5 18 5
West India and Pan.	1	—	1½	+ 1/16	—
Western Telegraph	7	8	14⅝	—	*5 7 8
Home Rails.					
Central London, Ord. Assented	4	4	75	+1	5 6 8
Metropolitan	1½	1	25	— ½	3 18 6
do. District	Nil	Nil	19	—	Nil
Underground Electric Ordinary	Nil	Nil	13½	—	Nil
do. do. "A"	Nil	Nil	6/6	—	Nil
do. do. Income	6	6	90¼	+ ¼	*6 12 3
Foreign Trams, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	5	—	6 0 0
Anglo-Arg. Trams, First Pref.	5½	5½	87½	—	7 2 0
do. 2nd Pref.	5½	5½	8	—	—
do. 5 Deb.	5	5	77½	—	6 9 0
Brazil Tractions	4	4	62	— ½	6 9 1
Bombay Electric Pref.	6	6	10½xd	—	5 14 3
British Columbia Elec. Rly. Pfce.	5	5	62	+2	8 1 4
do. do. Preferred	—	Nil	45	+3	Nil
do. do. Deferred	—	Nil	43	+2	Nil
do. do. Deb.	4½	4½	65	—	6 10 9
Mexico Trams 5 per cent. Bonds	—	Nil	40	—	Nil
do. 6 per cent. Bonds	—	Nil	34	—	Nil
Mexican Light Common	Nil	Nil	20	—	Nil
do. Pref.	Nil	Nil	33	—	Nil
do. 1st Bonds	Nil	Nil	40	—	—
Manufacturing Companies.					
Babcock & Wilcox	14	15	21⅛	— 1/16	5 2 0
British Aluminium Ord.	5	7	28/-	—	5 7 8
British Insulated Ord.	15	17½	12	—	7 5 10
British Westinghouse Pref.	7½	7½	51/-	-3d.	5 17 8
Callenders	15	20	12½	—	8 0 0
do. 5 Pref.	5	5	4¼	—	5 17 8
Castner-Kellner	20	—	9⅜	—	5 6 8
Edison & Swan, £3 paid	Nil	—	9/6	—	Nil
do. do. fully paid	Nil	—	1½	—	Nil
do. do. 5 per cent. Deb.	5	5	57	—	8 15 8
Electric Construction	6	7½	17/-	+3d.	8 16 6
Gen. Elec. Pref.	6	6	9⅞	—	6 1 6
Henley	20	25	16	—	8 1 3
do. 4½ Pref.	4½	4½	4	—	5 13 6
India-Rubber	10	10	12	—	*8 6 8
Telegraph Con.	20	20	89	—	*6 4 0

* Dividends paid free of income-tax.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Month ended (4 wks.)	Receipts for the month. £		No. of weeks.	Total to date. £		Route miles open.	Inc.
Blackpool-Fleetw'd	July 23	5,235	+ 577	29	17,764	+ 1,508	8	..
Bristol (Trams)	„ 28	21,018	+1,581	30	142,730	+ 3,715	30·5	..
Cork	„ 27	2,927	+ 134	30	14,746	— 81	9·89	..
Dublin	„ 28	27,753	+2,420	30	175,497	— 6,822	54·25	..
Hastings	„ 28	4,886	+ 598	30	27,242	+ 853	19·3	..
Lancashire United	„ 26	7,871	+ 806	30	52,278	+ 1,700	42	..
Llandudno-Col. Bay	„ 28	2,074	+ 80	34½	9,933	+ 213	6·5	..
Anglo-Argentine	„ 29	20,332	+3,409	30	1,528,391	— 3,223	..	..
Auckland	June 30	816	+ 63	52	274,763	+ 7,615	26 59	1·17
Calcutta	July 29	18,479	+ 886	..	..	+ 6,129	..	..
Kalgoorlie, W.A.	May	2,921	..	21	12,437	..	20.5	..
Madras	July 31	4,451	+ 279	30	29,140	+ 2,112	..	..
Montevideo	July	25,220	+ 59	30	266,288	+14,495	..	..
Dublin-Lucan Rly.	July 28	752	+ 95	4	752	+ 74	7	..

THE ELECTRICAL EQUIPMENT OF A MODERN FOREIGN SUBMARINE BOAT.

By NORMAN H. WOOD.

(*Concluded from page* 117.)

The main fuses for the auxiliary circuit are enclosed in the same box, which is located very close to the battery tank to ensure the main battery leads being extremely short. The cut-outs are mounted side by side in an explosion-proof steel case, with the operating handles brought through the sides. The overload and time-limit relays are mounted on the front cover and set to operate at 1,300 amps. in about two to three seconds. They are, therefore, non-operative whilst starting-up, but open should an overload last for more than the time limit stated above. In series with the solenoids is a small switch which opens with the cut-outs and releases the relays from electric pressure.

Each electrical circuit in the vessel is independently arranged with its fuses directly connected to the main battery leads, which ensures that in the event of any one set of fuses blowing no other circuit or circuits will be disturbed. The auxiliary power circuits are fed from the full battery pressure, whilst all lighting circuits are taken off the half battery pressure through double-pole change-over switches, to enable either half battery to be discharged at will, and double-pole switches to cut out the complete circuit. The general, instrument, and navigation circuits are provided with regulating resistances to maintain a constant pressure of 55 volts at any battery pressure. To prevent the boat being plunged into complete darkness, in the event of the general lighting fuses blowing, safety or police lamps are installed and fed from a separate circuit, but as no rheostat is provided in this particular circuit, the lamps are switched off during such time as the battery is on charge. Each lighting circuit is controlled from a special watertight gunmetal distribution box enclosing 6 D.P. fuses and 6 S.P. switches, and has cast on the underside three watertight sockets for portable connections; the spindles for operating the switches are brought through the front cover, which also carries a small hinged inspection flap for fuse renewals, &c.

The navigation lights comprise a masthead steaming light secured portable to the forward periscope, stern and stem anchor lights clipped to the handrails, a masthead flashing lamp secured portable to the after periscope, and the bow and stern lights. The last three lamps are fixtures built into the superstructure round about the conning tower, and fed directly from the navigation distribution box in the central station, whilst all portable navigation lamps are plugged on to the special box in the communication hatch behind the conning tower, to which is also connected the portable Morse key and condenser for the flashing lamp and the light in the portable compass which is used when steering from the bridge.

The general lighting consists of 16-C.P. metal-filament lamps enclosed in gunmetal guarded brackets bolted to the frames in the most efficient positions to avoid other internal gear, and controlled from distribution boxes in the engine room, central station, crew space, and officers' quarters; four additional 5-amp. D.P. watertight plugs are fitted in the engine room for portable lamps or small tools. Two self-contained portable magazine hand lamps, with suitable resistance to enable them to be charged from a 55-volt circuit, are carried in the central station.

Three electric hotplates of 750 watts capacity and three heats each, built into one frame, are installed in the crew space for cooking purposes; current for these is taken from a special distribution box placed just overhead, and connected to the plates through flexible portable leads.

Four portable electric radiators of 1,500 watts consumption, with three heats each, are carried to warm the officers' quarters and crew space in cold weather and special watertight D.P. sockets are fitted in these compartments to feed them. To ventilate these quarters in warm weather, two 12-in. noiseless fans with three speeds and trunnion movement are provided.

The vessel is equipped with one stern and two bow torpedo tubes firing 450-mm. Whitehead torpedoes by means of compressed air. Firing can be effected by hand or electrically. In the latter case, the firing valve lever is released by an electric solenoid energised from the lighting circuits through platinum-tipped push buttons, which are distributed in the boat in such a manner as will allow any tube to be fired from the conning tower, the central station, or at the tube itself. In each case, when not in use these buttons are secured with a padlock, the key of which is always in the possession of the Commander, to prevent the wilful firing of any tube.

A complete submarine bell signalling plant is installed, with an effective range of 12 miles; fitted with this equipment, the submarine can maintain communication with another submerged boat or similar plant on shore. Transmitting is performed by a large bronze bell placed mouth upwards in the forward superstructure, and supported by a special mechanism so arranged that the bell can be stowed below the plating when not in use, or quickly raised from the inside of the boat, clear of the superstructure, to permit the sound waves to travel out in all directions. The bell tongue is connected to a pneumatic cylinder, the slide valve of which is operated by a Morse key in conjunction with a condenser, the supply current being taken from the distribution box in the officers' quarters. The receiving plant has two special submarine microphones placed port and starboard in the lower forward part of the boat, well below the waterline. On the face of the microphone case is a circular machined groove lined with a thick rubber packing, which forms a perfectly watertight job when pressed on to the hull, through which a small hole is drilled to ensure the diaphragms always making good connection with the seawater. Two telephone receivers mounted on the same instrument box are used to collect the signals in conjunction with a 4-volt primary battery and small-change-over switch to enable either microphone to be placed in circuit. The key, condenser, and telephone receivers are conveniently mounted in the officers' quarters just above the starter for the forward 26-H.P. bilge pump motor, which arrangement allows signals to be transmitted and received very efficiently. Should the vessel accidentally sink in shallow water, the crew inside the submarine can release the safety mechanism known as the telephone buoy, by which the position of the sunken submarine can be located and telephonic communication set up between the boat and surface. The buoy itself consists of a wooden structure covered with 1/16 in. galvanised steel sheeting, and is secured to the superstructure by a screw releasing-mechanism operated by the crew inside the submarine. On top, the buoy has a hinged cover carrying a special watertight flashing lamp; on opening the cover, access is given to a portable microtelephone and pushbutton. In the boat is a second microtelephone with alarm bell and 4-volt primary battery enclosed in a light steel case, and a Morse key to flash the lamp on the buoy cover. Electrical communication is maintained through a 60-metre long 4-core cab-tire covered cable (two cores for the telephone and two for the lamp), which enters the boat and buoy through bronze stuffing glands or deck tubes. Current for the flashing lamp is taken

from the distribution box in the crew space. When not in use, the 4-core cable is coiled up in a special cable locker just aft of the buoy.

The three electrically-driven pumps used for diving, emerging, trimming, &c., are arranged to pump from any tank of bilge through the main and auxiliary water service, or to pump out any torpedo tube through the auxiliary connections. By means of change-over cocks the small auxiliary pump can either draw from or discharge to any tank or bilge. For salvage purposes, pipes are fitted from the main and torpedo bilges to the top of the vessel to permit water inside the submarine to be blown out from the outside. The two large pumps placed fore and aft are of the high-speed double-rotor centrifugal type, capable of delivering 2,000 litres per minute against a head of 30 metres with the rotors in parallel, or 1,000 litres per minute against a head of 60 metres with the rotors in series at a speed of 2,000 R.P.M. The changing over of rotors from series to parallel or *vice versa* is performed by the manipulation of a single cock. These two pumps are directly connected to 26-H.P. shunt-wound semi-enclosed electric motors with a speed variation of 1,700 to 2,000 R.P.M. at 115 volts, the slower speed being necessary to prevent the motors being overloaded when the pumps are working against no head; for example, when the submarine is running on the surface. A temperature rise of 30 deg. C. at the six-hour rate was specified to the motor makers with a permissible total weight of 610 kg. per motor.

The auxiliary pump is of the piston type, geared to an 8-H.P. shunt-wound totally-enclosed motor with a speed variation of 500 to 1,600 R.P.M. at 115 volts, and a temperature rise of 35 deg. C. after one hour's run at full load. This pump delivers 300 litres per minute against a head of 60 metres with a speed of 400 R.P.M. The motor, which is suspended from the frames, weighs 415 kg., and has its starter placed just overhead on the watertight bulkhead; the weight of this starter is 53 kg.

The motor coupled to the after bilge pump also drives, through a reduction gear box, the high-pressure air compressor and auxiliary manœuvring propeller; interlocked couplings are provided to prevent both units being driven at the same time with a heavy resultant overloading of the motor. The auxiliary propeller, situated right aft in the superstructure, is intended to aim the boat when a torpedo is to be fired, and to facilitate manœuvring when the submarine is in harbour. The starter for the forward pump motor is placed in the officers' quarters on the port side, directly opposite the motor itself, and weighs 65 kg.

To enable the auxiliary propeller to be started and stopped from a position near the periscopes, and thereby directly under the supervision of the officer in charge, the controller for the after pump is housed in the central station, immediately under the main motor cut-outs. This controller, which weighs 140 kg., allows three speeds in either direction at the ½-hour rate with its resistance enclosed in the casing, and is fitted with a separate interlocked lever to reverse the current in the armature when a change in the direction of rotation is desired. The capstan motor is of the series-wound totally-enclosed type, with an output of 2 B.H.P. at 1,600 R.P.M. and 115 volts for 15 minutes without the armature temperature rise exceeding 50 deg. C., and has a net weight of 115 kg. It is situated in the forward portion of the vessel, just under the torpedo tubes, and drives the anchor-winch and warping-bollard through worm and cog gearing, but, as the output of the motor is too small to allow these two units to be driven at the same time, the vertical driving shaft carrying the small driving wheel is fitted to allow an upward or downward movement along its axial length. This movement is controlled by a lever and hand-wheel, operated by hand power, placed close to the motor; when raised, the driving wheel engages the warping bollard; in the centre position it runs empty, and when lowered it drives the anchor winch. A friction clutch is inserted in the drive to prevent the motor being pulled up quickly or brought to a standstill when the submarine is being docked or the anchor housed. Despite the fact that the anchor winch is fitted with a tell-tale, experience has proved that such a clutch is very necessary, as the motor is too often left running after the anchor has been housed. The controller for this motor is secured to the frames on the port side of the officers' quarters, with its operating shaft extended through the shell into the superstructure to allow the motor to be started and stopped from the deck as well as the interior of the boat. Three speeds in either direction are allowed for, with the resistances and a small overload release enclosed in the controller casing. The net weight of this controller in running order is 52 kg.

The semi-enclosed steering motor suspended from the upper frames on the starboard side of the crew space is of the flapper brake type, designed to give 1 B.H.P. at 1,200 R.P.M. with 115 volts continuously with a net weight of 275 kg. It drives the rudder-actuating shaft through worm gearing, on which a double clutch is fitted to enable the electrical driving gear to be cut out and steering performed by hand in the usual way. The motor is controlled by two automatic contactors operated electrically, either by a small controller or portable push-buttons. The controller is of the follow-up type, with the two outer rings connected to the hand steering wheel, and the inner quick-breaking switch coupled to the rudder-actuating shaft through a small chain. The sailor turning on the handwheel in either direction causes contact to be made by one of the outer rings in the controller with the inner quick-breaking switch by sliding over the same when a current is caused to pass through one or other of the contactors, and the motor at once starts without any resistance in circuit. The motor turning the rudder-actuating shaft causes the inner switch to revolve in the same direction as was taken by the outer rings until the zero position is reached, when it quickly snaps out, and the motor is brought to a standstill by the flapper brake.

Mechanical limits are provided on the rudder shafting to prevent the sailor overturning the controller, and platinum-tipped limit switches to protect the motor and gear when the push-buttons are in use.

The contactors are of the usual vertical type, mounted side by side in a light watertight steel case and fitted with magnetic blow-outs and renewable sparking pieces; further, a mechanical device prevents them being operated together. In parallel with each contactor is a 2½-C.P. signal lamp, coloured red or green, to indicate whether the rudder is being swung to port or starboard. The controller is only called upon to deal with the current passing through the coil and lamp, about 0.55 amps., which is so small that practically no arcing takes place inside the same when in use.

The two push-buttons, mounted in a small portable bronze box, have their tops enamelled red and green, and, in common with the controller are connected to the mains by three pin watertight plugs and sockets, with the pins of varying sizes to prevent wrong connecting up. Such a socket is fitted on the bridge, in the conning tower, and in the crew space, close to the steering motor, to permit the submarine to be steered electrically from either of these positions. A very small portable motor-driven dessicating gear is carried to dry out the periscope tubes and lenses, which, when in use, is plugged on to one of the lighting distribution boxes. All fixed cables throughout the vessel are

of H.C. copper insulated with pure para rubber, taped, lead-covered, and armoured with interwoven flexible steel wires impregnated with red-lead paint. They are secured to the frames with brass clips and screws in the most suitable positions to avoid other internal gear. Cables passing through the shell are encased in copper pipes, with a stuffing-box at the lower end inside the boat, and a union connection to the fixture they are feeding. This arrangement entirely prevents ingress of seawater, and in the event of the tubes being pierced no water can percolate into the submarine. Wherever cables pass through a watertight bulkhead they are led through double-ended stuffing-boxes.

Owing to the excessive amount of moisture which is always prevalent in a vessel of this class, the Navy to whose order the boat was built specified that, as far as possible, the complete electrical gear was to be of the watertight type, and in those cases where, owing to restricted weight and space, it was found necessary to install splash waterproof gear, that, in the event of water reaching these units, their protecting fuses were to blow and isolate the circuits. These stipulations were rigidly enforced and carried out, so that should the boat sink in shallow water and fill, the battery would be immediately isolated electrically from such circuits and, provided the rubber cover over the battery tank received no damage, the cells could not come in contact with seawater and liberate chlorine gas.

The only switchboard in the vessel is the auxiliary, on which are mounted the switches and fuses for all motors, heating, and cooking circuits, also the change-over and double-pole switches, fuses, &c., for the various lighting circuits. The board is of the watertight type, with the switch handles taken through the cover, which also carries small inspection doors for fuse renewals, &c. Above the board are an ammeter for the auxiliary circuits, and a combined ammeter and voltmeter for the general lighting circuits, whilst at the after end are the ampere-hour-meters for the above circuits and regulating rheostats for the general and navigation light circuits. The projector compass, housed behind the conning tower, is provided with a drying lamp and two 6-volt interchangeable lamps to illuminate the compass card, the voltage for these being shunted from a resistance.

The greatest difficulty confronting an electrical engineer in a submarine of this size is the very limited amount of space and weight allowed. As, when running submerged, the boat depends entirely on its metacentric heights for stability, it follows that all weights must be reduced to the smallest possible limit, and that all heavy gear has to be placed as low as possible in the vessel to keep down the position of the boat's centre of gravity, and thus help to increase the metacentric heights. With this object in view, the electrical gear installed was of the very lightest possible type; wherever possible, very light steel cases were substituted for those of cast gunmetal (aluminium was not allowed owing to the corrosive effect of seawater), and the cables loaded to the utmost, particularly those feeding the main motor, where 2 amps. per mm.^{2} was allowed as a safe working standard. All motors have cast steel yokes and end brackets to reduce weight and bulk, and in all cases (except the main propelling motor) are supplied with ball bearings. The total weight of electrical gear in the submarine is about 49,600 kg.

English Electrical Man Imprisoned in Mexico.—A Washington dispatch to the *Daily Mail* says that the British Embassy has entered a vigorous protest at the State Department against the imprisonment of a British subject, Mr. Fuller, the president of the Electric Light Co. of Mexico City. It is reported that the Carranza Government imprisoned Mr. Fuller because he refused the demands of his employés, who are on strike.

ELECTRICITY FOR SMALL HOUSES.

Referring to our abstract of a recent paper on "The Economy of Electricity in Small Houses," we subjoin some figures relating to the use of electricity in a small house in an industrial town in Scotland. The house consists of three principal apartments—a sitting-room, a dining-room (formerly a kitchen), and a bedroom—with scullery, bath-room, &c., and forms one of six dwellings in a tenement. The rent of the house is £32, which includes rates and taxes. The occupants comprise two adults and one child.

During the past three years, electricity was used for lighting, cooking, and occasional heating, while coal was used in the kitchen for hot water and heating the kitchen, and also for the heating of the sitting-room and bedroom. The annual cost of electricity and coal averaged :—

Electricity	£6	4	11
Coal	6	13	6
Total	£12	18	5

which is equal to 4s. 11d. per week, on the average.

Early in May of this year, the experiment was commenced of burning coal in the dining-room once a week for heating water for hot baths, all other heating being done exclusively by electricity. The results, as shown by the following statement of costs, have been quite successful.

The electrical equipment is as follows :—Besides the usual lighting installation, there are electric fires in each of the apartments—a 3-KW. "Carron" radiator in the sitting-room, a 1½-KW. "Magnet" fire in the bedroom, and a 2-KW. "Belling" fire in the kitchen (which is now the dining-room). These are fed on one circuit of 7/21 S.W.G. cable, the voltage being 250. In the dining room a small "Carron" cooker is in use of a capacity of about 4 KW., with oven, grill, and two hot-plates. As an adjunct to the cooker, a 2-pint kettle (700 watts), with self-contained element, and a radiant-heat "Belling" boiling ring have been provided for fast boiling. In the scullery a 2-KW. "Jackson" water boiler, with ball-cock valve, has been fitted to the water supply. The cooker and hot-water heater are connected to a second circuit wired with 7/21 S.W.G. cable. All the cooking appliances have been in daily use for all meals since they were installed, but the radiators have only been put on at intervals when heat was required on cold days. The lighting rate is 3d. per unit, and the charge for heating is ¾d. per unit. On May 24th a separate meter was fixed on the heating circuit to register the energy used for this purpose, as distinct from the more regular consumption by the cooking appliances. The units used for cooking, heating, and lighting respectively, commencing from May 24th, 1916, were as tabulated below :—

To	No. of days.	Cooking units.	Average per day.	Heating units.	Lighting units.	Total units.	Average per day in units.
May 28th ...	4	21·7	5·4	5·1	0·2	27·0	6·7
May 30th ...	2	12·0	6·0	0·2	0·2	12·4	6·2
June 14th ...	—	—	—	—	—	—	—
June 18th ...	4	23·1	5·8	6·6	0·4	30·1	7·5
June 25th ...	7	37·4	5·3	1·1	0·3	38·8	5·5
July 2nd ...	7	28·1	4·0	·1	0·1	28·3	4·1
July 9th ...	7	38·3	5·5	·5	0·3	39·1	5·6
July 16th ...	7	44·9	6·4	10·6	0·5	60·0	8·6
Total ...	38	205·5	5·4	24·2	2·0	235·7	6·2

Note.—House closed during first part of June.

For the whole period the total costs were therefore :—

Cooking, 205·5 units at ¾d. =	12s.	10½d.	= 2s. 4½d. per week
Heating, 24·2 „ at ¾d. =	1s.	6¼d.	
Lighting, 2·0 „ at 3d. =	0s.	6d.	
Total electricity (38 days) =	14s.	10¼d.	= 2s. 8¾d. per week.
Coal used during the same period, 1½ cwt., at 1s. 7d. per cwt. ... ... =	3s.	2¼d.	
Total cost for coal and electricity (38 days) =	18s.	1d.	= 3s. 4d. per week.

The average weekly cost of heating, cooking, and lighting thus has been only 3s. 4d. Prior to the commencement of the experiment, the average weekly coal consumption for the summer months was 2 cwt. at 1s. 6d. = 3s., to which must be added the previous cost of electric cooking only, namely, 1s. 11d. per week—a total of 4s. 11d. per week. The saving effected, therefore, by the new arrangement (allowing 2d. per week for electric lighting) amounts to 1s. 5d. per week. In addition to this, there is the further saving in the wages of a charwoman, who previously was engaged for four hours each week at a cost of 2s.; and whose services are now required for four hours each fortnight. It is right also to point out that the electric water heater, while mainly used for the heating of water for washing up, has also been utilised for the washing of clothes not sent to the laundry. The consumption of energy for cooking also includes the energy taken by an electric iron of 550 watts, which is in use every day for about half an hour. It is estimated that for the summer six months a total saving of between £1 10s. and £2 will be made, and experience has already shown that the housework has undoubtedly been very considerably reduced.

During the winter months the intention is to revert to the old arrangement of burning coal for heating rooms and providing hot water, as the increased consumption of electrical energy for the heating of rooms in the winter would be prohibitive in cost. Electric cooking and occasional electric heating will, as before, be continued throughout the whole year. Excepting the kettle and iron, the apparatus has been obtained on hire from the local supply authority, the rental for the whole of the hired appliances totalling 8s. per quarter.

A NOVEL ELECTRIC-CLUTCH GEAR FOR MOTOR-CARS.

An interesting new form of power transmission for petrol motor-cars, known as a centrifugal electric generating clutch, has recently been brought out by the Vesta Accumulator Co., of Chicago, U.S.A. The device, which may be described as a combination of the magnetic-drag principle and the friction contact as obtained in the ordinary form of clutch, replaces not only the clutch, but also the change-speed gear box and electric generator and engine starter which at present form part of what may be termed the standard design of petrol cars. It also eliminates the use of the clutch pedal, the emergency-brake lever, and the change-speed lever, all controls in the new arrangement being by push-buttons on the steering column, and the brake pedal.

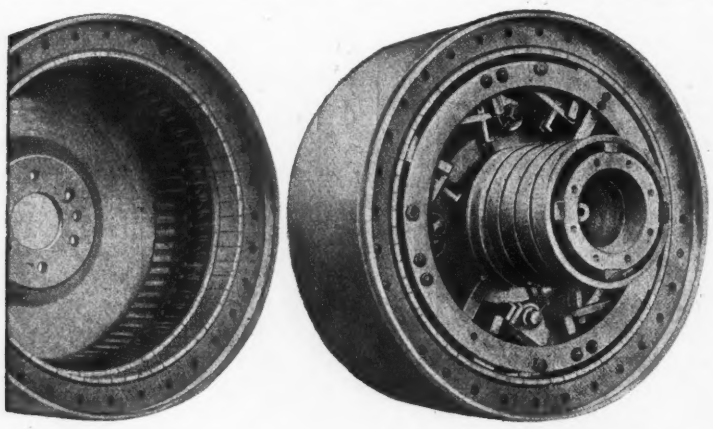


Fig. 1.—Interior of Clutch. Fig. 2.—Complete Clutch.

The device consists of two main parts: the armature and the fields. Unlike the average motor or dynamo, the fields are on the inside and the armature on the outside. The armature, in fact, forms the engine flywheel, and is bolted direct to the flange on the rear end of the crankshaft. The armature is in the shape of a drum, in which are mounted the armature laminations and form windings, which are connected to an internal commutator fastened to the outer edge of the armature drum, as shown in fig. 1. The fields, fig. 3, are attached to the propeller shaft, which conveys the power to the rear axle of the car; they are mounted inside the armature on the crankshaft extension, and rotate freely on roller bearings.

The brushes, which are part of the field unit, press outwardly against the face of the internal commutator. The brushes are mounted in such a way that the centrifugal force of their rotation

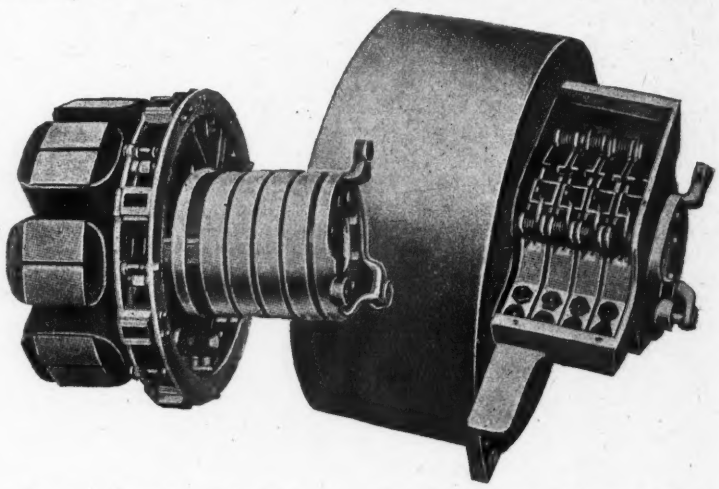


Fig. 3.—Magnets and Brushes of Clutch.

Fig. 4.—View showing Collector-ring Brushes.

increases the force with which they press against the commutator. When the engine of the car is at rest, the pressure is very light; but when it is running, and as the speed of the car increases, the pressure of the brushes against the commutator also increases, until, when the car attains a speed of 15 miles per hour and over, on level roads, the friction (carbon against copper) is sufficiently great to prevent any slip between the fields and the armature. That little wear takes place on the brushes is evidenced by the fact that tests made with brushes 2½ in. long showed only $\frac{3}{64}$ in. wear on a car that had covered a distance of 12,000 miles. At lower speeds, and particularly in starting, the transmission of power is through the electromagnetic drag between the armature and fields; there is therefore no mechanical connection between the engine and the propeller shaft until the car speed reaches a predetermined maximum, which may be altered to suit different conditions.

By means of the new clutch, the makers claim that great flexibility can be obtained in starting the car or in "picking up" after a slow-down in traffic, and as the speed of the car increases, the greater the centrifugal force and the less chance of slip. The slip that does occur in starting is not wasted, the energy generated being utilised to keep the battery, used for engine starting and lighting purposes, in a fully-charged condition. For this purpose the field is provided with four slip rings with which brushes make contact. The battery consists of four sections of six volts each, of a total capacity of 200 ampere-hours, while the controller comprises a number of switches operated by push-buttons through a solenoid, and arranged to work automatically in conjunction with the engine throttle lever and accelerator pedal.

The pushing of the engine-starter button operates the series side of the controller, causing the battery to be coupled up in series in a 24-volt, 50-amp.-hour connection. The operation of the engine throttle or accelerator automatically causes the other, or multiple, side of the controller to parallel the battery to a 6-volt, 200-amp.-hour connection. The controller is so arranged that it is impossible to close both series and parallel circuits at the same time.

The operation of a car fitted with the system is claimed to be exceedingly simple. The vehicle goes through all ranges of speed, from zero to the maximum, by the simple opening of the engine throttle, the electrical and centrifugal action being entirely automatic. To start the engine, all that is necessary is to open the throttle and push in the starter-button; the fields are then held stationary by an automatic locking arrangement, and the flywheel armature is revolved about them. The automatic locking device renders it unnecessary to apply the brakes to hold the fields stationary in the starting operation, and prevents any chance of the car running backwards. The operation of the throttle lever or accelerator automatically makes an electrical connection between the battery fields and armature, so that, when the throttle is further opened, the internal fields immediately try to catch up with the

revolving armature through the magnetic pull, assisted by the ever-increasing centrifugal force.

Assuming that the car is approaching a hill requiring greater clutching effort, the gradient will cause a greater load against the movement of the car, consequently causing the fields to run slower than the armature which is connected to the engine, this difference of slip causing current to be generated. The current will commence to flow through the fields until the field coils have received somewhat more than their normal amount, this small excess amount being due to the fact that the cut-out is made to cut in when the voltage is higher than 8 volts.

When a still greater clutching effort is required above that which is produced by the current flowing in the fields, the current will flow through the battery, making up for the difference required in the clutching effort, since this greater amount of clutching effort will have caused the cut-out to cut the battery into circuit. When the hill has been mounted, the centrifugal clutch will cause the current to cease flowing as before, and will recommence doing the work of driving the car.

It will be seen that the centrifugal clutch can do all the work without the aid of any electrical circuit after it has once cut in, but no current would then be available for engine starting and car lighting. The centrifugal action is consequently so arranged relative to the electric generating effect as to furnish the current for the charging of the battery with as little waste as possible. When the car is slowed down or is to be stopped, it is only necessary to close the trottle, this breaking all the electrical connections, the car then "coasting" until it stops by itself or by the application of the brakes.

For reversing the car, as well as for emergency purposes in very hilly districts, a small gear-box providing a reverse motion and a low forward speed is included in the transmission, this being operated electrically by push-buttons on the steering column.

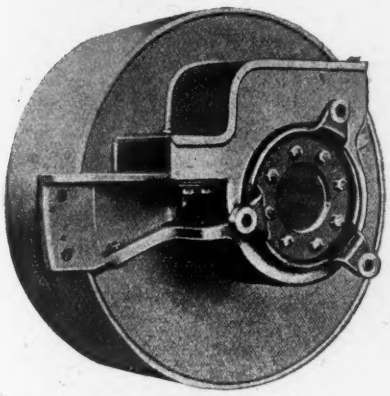


Fig. 5.—Clutch complete with Cover.

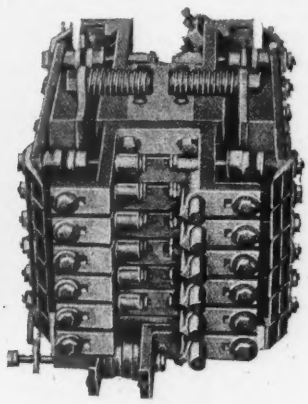


Fig. 6.—Control Switches.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

"Twenty-Two Deaths from Heat Stroke."

After seeing the following paragraph in two evening papers and one morning paper, I begin to think its incredible and disgraceful story has some truth in it :—

The Secretary of State for India announces the receipt of the following telegram from the Viceroy of India:—

On recent voyage of hospital ship *Dongola*, from Basra to Bombay, there were 130 cases of heat stroke among British sick and wounded troops, and 17 deaths due to heat stroke occurred among troops and crew, and five other deaths were probably caused by heat.

A following wind necessitated ship *being turned round every four hours* for first 36 hours of voyage, *so that wards could be ventilated.* Voyage was made under most trying climatic conditions.

The *Dongola* is a P. and O. liner of 8,056 tons, built in 1905 specially for the Indian Troop Service, in which she was employed continuously till war broke out, when she was converted into a hospital ship.

About nine years ago, as your records will show, I brought an action against a steamship company trading with South Africa for falsely representing it had electric ventilation, with the result that many hundreds of electric fans were immediately sold to shipowners, but how it comes about that a P. & O. liner specially built for Indian troop service, sailing in its own waters, and acting as a hospital ship, should lack proper ventilation is inexplicable.

This seems on all fours with the Indian troop train incident, where our brave men were allowed to suffer intolerable agonies and death due to the scandalous neglect of persons in authority, too ignorant to understand, and too callous to attend to, most obvious requirements.

A stern wind of a speed equal to that of the boat is no novelty, and is a concomitant of almost every mail steamer on its homeward journey from Capetown.

This has been called an engineer's war, but he has not yet been fully appreciated and used in very many directions, of which the above is one more instance.

Justus Eck.

London, S.E., *August 8th*, 1916.

Induction Motors on Circuits of Different Frequencies.

The following information regarding the behaviour of induction motors on different frequencies may be of use to your correspondent "Practice" :—

In making changes of the kind suggested, the main point to watch is to keep the flux density in the iron the same as before the change. By so doing, the stator and rotor currents will remain unchanged when working against the same torque. To keep this density the same, however, necessitates a variation of the impressed voltage with the frequency.

The first effect of reducing the frequency is to reduce the speed ; for instance, a 60-cycle motor will run at only $\frac{5}{6}$ of its normal speed if connected to a 50-cycle circuit. To keep the stator and rotor currents the same as they were before the change, the torque must be kept the same. Owing to the reduced speed, therefore, the horse-power of the motor will be less than normal—the decrease being about $\frac{1}{6}$ the rated horse-power.

It is often undesirable to alter the voltage in proportion to the change in frequency, and 60-cycle motors are often run on 50-cycle circuits of the same voltage. In such a case the magnetic densities in the iron will be $\frac{5}{6}$ of the normal densities. The iron losses will, therefore, be increased, and a warmer running motor is the result. The poorer ventilation at the lower speed tends to aggravate this heating. The efficiency of the motor will be slightly decreased on account of the increased iron losses, the actual loss in any motor being dependent on the degree of saturation of the iron at normal frequency. The higher flux density will increase the magnetising current required, and the power factor may therefore be lowered. If the voltage is corrected for the lower frequency, the power factor may be slightly increased, though this is by no means generally the case.

In running a 50-cycle motor on a 60-cycle circuit the chief consideration is generally the ability of the machine to withstand the extra stresses due to the 20 per cent. increase in speed. If the voltage remains the same, the flux density will be only $\frac{5}{6}$ of the normal. The iron losses will therefore be decreased, though the rise in frequency reduces this decrease somewhat. Since the increased speed gives better ventilation, the rated horse-power may generally be maintained, and in some cases exceeded, if mechanical considerations permit. The slip will be increased, and on this account the power factor may be lowered slightly.

Whether the machine is run on a higher or lower frequency than that for which it is designed, the actual performance depends to such an extent on the magnetic and electrical designs, that it is difficult to generalise. Two motors of equal voltage, frequency and output may behave quite differently as regards heating, efficiency, and power factor when run on a higher or lower frequency circuit. The writer hopes, however, that from the above, "Practice" will be able to form an idea as to what to expect when running motors under the suggested conditions.

A. B. J.

From the Front.

I am again writing a line of thanks to you for the weekly copy of the REVIEW, which still reaches me regularly. I wish it were possible to read it under pre-war conditions once more—with the sing of the turbine in the ear and everything comfortably loaded. I'm afraid that shift work will prove somewhat irksome to a good many when the time comes to "take over" again. But perhaps when that happy time arrives we shall find log-books, load curves and all the rest of it under the spell of the eternal feminine!

I need not add that the REVIEW is still appreciated. It is distressing to read the long list each week in the "Personal Column" of good men who have gone under. Now that we are "at the peak," may the end be not too far ahead.

J. H. Pembry, A.S.C., M.T.

British Expeditionary Force, *August 3rd*, 1916.

Automatic Train Control.—According to the *Electric Railway Journal*, the New Haven Railroad, which is investigating the question of automatic train control, has examined over 4,000 plans of automatic stops, and tested two trial installations during the past four years. As a result, the officials are convinced that automatic train control has not reached the degree of development that would eliminate the introduction of other and greater hazards, and warrant either universal or limited adoption by the New Haven line. The company has, however, appointed an engineer to give his whole time to the study of the problem.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

EGYPT.—Revised Tariff Valuations for use in assessing duties on iron and steel manufactures imported into Egypt have been issued, with effect from June 16th to August 15th. Duty is leviable on the Valuations at the rate of 8 per cent.

BRITISH INDIA.—The information contained in the official *Supplement* to the *Board of Trade Journal*, July 13th, respecting prohibitions is modified by a later announcement that the export of sickle-dressed block clear ruby and slightly-stained ruby mica of sizes Nos. 3, 4, 5, and 6 Bengal standard, is prohibited to all destinations; and all other descriptions of mica are prohibited to destinations other than the United Kingdom and British Possessions. These prohibitions apply unless a permit, signed by the Chief Customs Officer, is produced to the Customs Collector at the port of export, and the mica shipped in accordance with the terms of the permit.

ST. LUCIA.—An Ordinance has been issued providing for the amended Customs Tariff—*vide* the *Review* of July 30th, 1915—to continue in operation until June 30th, 1917. Under the amended Tariff, telegraphic, telephonic, and electrical apparatus, and appliances of all kinds for communication or illumination, are free of import duties. All other electrical machinery and electric dental appliances of all kinds are dutiable at the rate (including the 10 per cent. surcharge) of 13.2 per cent. *ad. val.* under the British Preferential Tariff, and at the rate of 16.5 per cent. *ad val.* under the General Tariff. All other electrical apparatus is dutiable at the flat rate (including surcharge) of 16.5 per cent. *ad val.*

GREECE.—A Bill was introduced on June 14th providing for a general increase of the Greek Tariff rates of duty by 10 per cent.—the additional duty to be collected from the date of introduction of the Bill—and also making provision for certain other alterations in the Greek Customs régime. According to information received at the Foreign Office from His Majesty's Minister at Athens, the proposed increase has now been suppressed, and the sums already paid to the Greek Government in respect of this increase will be refunded. The other modifications proposed will also not take effect.

UNITED STATES OF AMERICA.—The Treasury Department has issued, under date June 3rd, the following Circular regarding the appraisement of merchandise in respect of which a notice of change in value has been received:—

"It appears from a discussion at the appraisers' conference that there is a lack of uniformity in appraising merchandise of which notice of a change in value has been received. Some appraising officers apply the new price on all shipments made after the change of price, and others wait until they have evidence of deliveries at the new price either in the country of exportation or the United States.

"It further appears that there are two classes of merchandise, viz., one which may be termed stock goods which are ready for delivery at all times, and the other goods which are manufactured on orders for future delivery.

"As to the first class, the Department is of the opinion that the new price should be put into effect on all purchases made after the date on which the new price is to take effect, but that as to purchases made before that date and not shipped until after the new price becomes effective the new price should not be applied unless there is evidence that sales have been made at the new price.

"With respect to the second class, the new price should be applied to old contracts only when there is evidence that deliveries have begun at the new price. When the appraising officer has no information as to whether sales have been made or delivery begun at a changed price, he should withhold appraisement until he can secure information on the subject."

A decision respecting the application of the United States Tariff Act of 1913 has recently been given by the Court of Customs Appeals, that flaming arc-lamp carbons composed of lamp black or retort carbon, with or without a core impregnated with chemical salts, are dutiable under paragraph 82 of the Tariff at the rate of 40 cents (about 1s. 8d.) per 100 ft.

Variation of Friction Losses with Temperature.—According to W. Peukert in the *E.T.Z.*, as the results of tests carried out on a D.C. motor of 11·5 KW., the losses due to friction of the journals, brushes, and air-churning diminish with rising temperature. These losses were at 18° C. 421 watts, at 40° C. 308 watts, and at 54° C. 208 watts, the corresponding efficiencies being respectively 86·68, 87·47, and 88·35 per cent. The armature losses remained constant, the resistance of the winding increasing with the temperature, whilst that of the brush contacts diminished. The magnitude of the change in the friction losses is surprising, and evidently the subject deserves further attention. The temperature of the room in each case was artificially regulated so that all parts of the machine were equally heated, and the instruments were installed in a neighbouring room unaffected by the temperature variations.

NEW PATENTS APPLIED FOR, 1916.

(NOT YET PUBLISHED).

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

10,386. "Electrical connectors or junction pieces." G. H. Collins & H. F. Collins. July 24th.

10,402. "Interrupter arrangements for electric circuits, chiefly for use with internal-combustion engines." H. R. Wright. July 24th.

10,412. "Supports for accumulators." C. G. Bennett & H. Garde. July 24th.

10,428. "Electrical and automatic laying of anti-aircraft guns." M. A. V. van den Eynde. July 24th.

10,458. "Electric lamp shades, reflectors, etc." A. Reynolds & F. A. Reynolds. July 25th.

10,491. "Electrical driving for motor-vehicles, etc." H. Crochat. July 25th. (France, May 9th.)

10,519. "Electric motors and dynamos." A. Lyon and Wrench & J. C. Todman. July 26th.

10,535. "Electric resistances for compensating, etc." J. E. Pollak (Soc. Anon. des. Etablissements L. Bleriot). July 26th.

10,554. "Electric cable joint boxes." C. Vernier. July 26th.

10,558. "System of electric signalling." L. Cohen & G. O. Squier. July 26th.

10,561. "Circuit controllers." Igranic Electric Co. (Cutler-Hammer Manufacturing Co.). July 26th.

10,563. "Galleries for gas and electric fitments." T. Cracknell. July 26th.

10,573. "Rotatable contact-breakers for magnetos, etc." E. J. Pilblad. July 26th.

10,576. "Wireless telegraphy and telephony." J. Bethenod & E. Girardeau. July 26th. (France, August 10th, 1915.)

10,588. "Attachment of ammeters and voltmeters to supports." V. Delebecque & Walsall Electrical Co. July 27th.

10,589. "Ammeters and voltmeters." V. Delebecque & Walsall Electrical Co. July 27th.

10,611. "Automatic telephone call distributing systems." Western Electric Co. July 27th. (United States, December 19th, 1914.)

10,627. "Electrical transmitting apparatus." H. K. Harris. July 27th.

10,640. "Controllers for electric motor circuits." Igranic Electric Co. (Cutler-Hammer Manufacturing Co.). July 27th.

10,677. "Controllers for electric motors, etc." Electric Control, Ltd., & O. Ellefsen. July 28th.

10,705. "Magneto-ignition devices." G. R. Salt. July 28th.

10,713. "Valves for receiving or producing wireless current." E. R. Clarke, Edison and Swan United Electric Light Co., & S. R. Mullard. July 28th.

10,720. "Combined starter and lighting dynamos." A. H. Midgley & C. A. Vandervell. July 28th.

10,721. "Magnetos, etc." W. O. Kennington. July 28th.

10,722. "Method for producing high-frequency oscillations." I. Chortik. July 28th.

10,734. "Field magnets for electric dynamos and motors." Lyon & Wrench and L. Murphy. July 29th.

10,745. "Anodes for electro-plating." G. Jones. July 29th.

10,750. "Time meter for alternating current." Allgemeine Elektricitats-Ges. July 29th. (Germany, April 26th, 1915.)

PUBLISHED SPECIFICATIONS.

1913.

26,934. Transformation of the Frequency of High-Frequency Alternating Currents for Wireless Telegraphy and Telephony by means of Dynamo-Electric Machines. Soc. Marius Latour et Cie. November 22nd. (November 22nd, 1912.)

1915.

9,852. Impulse Transmitters for Telephone Systems and the like. Relay Automatic Telephone Co., and L. C. Bygrave. July 6th.

9,921. Electrical Transformers. G. Harlow. July 7th.

9,934. Small or Pocket Electric Flash Lamps. F. O. Trautmann. July 8th. (Cognate application 12,377/15.)

9,964. Electric Joint. G. H. Scholes. July 8th.

9,981. Electric Clock. F. O. Read. July 8th.

10,067. Electric Time Switches. E. H. Horstmann and Horstmann Gear Co. July 10th.

10,121. Incandescent Electric Lamps and Holders therefor. T. P. Casotti. July 12th.

10,242. Shaft Packings. British Thomson-Houston Co. (General Electric Co.). July 14th.

10,453. Electrical Driving of Spindles for Spinning, Twisting and like machines. Siemens-Schuckertwerke Ges. July 19th. (July 20th, 1914.)

10,454. X-ray Tubes. British Thomson-Houston Co. (General Electric Co.). July 19th.

10,938. Electrical Switch Controlling Devices. A. W. House. July 28th.

11,201. Mounting of Switches and other Electrical Apparatus in Wall Boxes. C. H. Burt. August 3rd.

11,322. Cord Grips for Electrical Purposes. R. G. Stripp. August 5th.

11,776. Telegraphic Transmitting Apparatus. F. B. Dahl. August 14th.

11,831. Transmitters for Wireless Telephony. Marconi's Wireless Telegraph Co. and S. O. E. T. Trost. August 16th.

12,276. Attachment of Insulator-carrying Arms to Telegraph and like Poles. Bullers, Ltd., and H. C. R. Dagnall. August 26th.

13,807. Miners' Electric Lamps. G. A. Bellamy. September 28th.

13,943. Method of Manufacturing the Caps for Electric Incandescent Lamps. C. E. Hunter. October 1st.

14,382. Contact Breakers of Induction Coils. M. A. Codd. October 11th.

14,496. Filling with Insulating Compound of Electric Cable Junction Boxes. W. T. Henley's Telegraph Works Co. and F. Harris. October 13th.

14,783. Electric Stoves. J. D. Crary. October 19th.

15,459. Electric Lamp Holders. General Accessories Co. (L. Rosenthal and C. Seymour, Transvaal.) November 2nd.

16,797. Casings for Portable Electric Flashlights, E. C. R. Marks (Interstate Electric Novelty Co.). November 29th.

17,328. Anodes for Electro-plating. G. Jones. December 10th.

18,222. Method for Connecting Together Carbon Electrodes used in Electro-Chemical and Electro-Metallurgical Processes. R. Haddan (Soc. Francaise des Electrodes). December 31st.